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ELECTRICAL REVIEW

Vol. CXLVI No. 3779 28TH APRIL, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1878

A Hobbled Industry

CURBS ON ELECTRICITY SUPPLY EXPANSION

THE exasperation of the whole electrical industry—supply, manufacturing and contracting, and of its customers, found an outlet in Lord Citrine's speech at last Friday's annual luncheon of the Electrical Development Association.

Lord Citrine, whose enthusiasm for his work is so evident, finds himself in an unenviable position. He and his colleagues were given the task of extending and improving the supply but ever since they took office they have been handicapped by the lack of certain equipment. The reasons for the inadequacy of plant date back to wartime and are partly physical and partly financial. The financial aspect is the responsibility of the Government and this applies particularly to expenditure upon distribution.

Curtailment of Service

Instead of the £50 million which is the minimum that the Electricity Boards could do with to attempt to overcome some of the arrears of work the Government has decreed that the limit shall be £35 million this year—£5 million less than last year's inadequate amount.

To suppress demand the Government also maintains a heavy purchase tax on many electrical appliances. In the meantime thousands of people want cookers and other equipment which they can only afford by extended payment. The Electricity Boards seem to be the only bodies able to sell appliances on these terms and the restriction on their expenditure prevents them from meeting the needs. For this reason people are being forced to adopt gas. Can it be wondered at that the electrical industry sometimes thinks that there is more in this business than is admitted?

Mistaken Ideas

There are two possible explanations of the Government's attitude. First it may still think that it is protecting the B.E.A. against excessive demands upon inadequate plant by discouraging the public's obvious desire for electricity. The second is that in the interests of competitive services electrical development must not be allowed to go beyond certain limits; there must be planning or co-ordination.

The first idea is a mistaken one; there are valleys to be filled as well as peaks to be avoided. The second proposition comes from "planners" who think that they can neatly arrange economic affairs in the "national interest." These are the direct political descendants of Canute's advisers.

Lord Citrine's strictures were, however, not confined to the Government. He spoke also of the apparent inability of plant manufacturers to meet the B.E.A.'s demands, but this surely relates only to certain plant and will be surmounted.

As was stated in the B.E.A.M.A. annual report to which we referred

last week, and as Sir Vincent de Ferranti emphasized in his speech at the luncheon, the turbo-generator manufacturers are actually ahead of the demand and still export considerable quantities of equipment. Delivery is held up by retarded power station construction and by delays in the provision of boiler plant due to some extent to that cause. Now that the "phasing" of construction is in the B.E.A.'s own hands there should be a speeding-up in this respect. As to boiler plant, while there may have been shortcomings the makers claim that they are now in a position to equip stations as soon as they are ready to receive the plant.

There must be no talk of capital cuts on the ground that the stations needed to meet the demand cannot be built anyway. Orders have to be placed now for plant required in three or four years' time and allocations of expenditure must have regard for the position as it will be then. And the indications are that all sections of the industry will be able to do all that is required of them.

NATIONAL AND LOCAL DEVELOPMENT

In electrical development the "local touch" is essential, for habits and requirements vary considerably in different parts of the country. This need had already been recognized by the Electrical Development Association in its establishment of area committees. But whether because of their insistence on autonomy or because they thought that "devolution" had not gone far enough, the Electricity Boards (with the exception of the North Eastern Board) are to set up their own development "machinery" and the area committees have been dissolved. Close contact with the central body will continue and the position is to be reviewed later this year. It remains to be seen whether this will strengthen or weaken the industry's hold on the public.

There are many services which can be better performed on a national scale. If full advantage is taken of these services and they are properly married with local efforts the ultimate effect should be beneficial.

BRITISH INDUSTRIES FAIR

Next week's issue of the *Electrical Review* will contain a guide to the British Industries Fair. This will include a numbered plan of the Electrical Section at Castle Bromwich with brief details of the exhibits there and in London.

INSTALLATION AND MAINTENANCE

The mutually dependent relations of the three main components of the electrical industry was implied by all speakers at the A.S.E.E. function reported in this issue. Healthy progress in one depends largely on the status of engineers in the others. Status is more readily determined for those engaged in the manufacture of electrical equipment and the supply of electricity—specialized industries in which the management knows exactly the kind of training required of staffs—than is possible in the varied and often non-electrical industries in which members of the A.S.E.E. are employed.

The importance of the aids, outlined by Mr. A. G. Ramsey, which are given by the Association to engineers in this category to make their full contribution to the good of the electrical industry as a whole, and therefore also to the public, can hardly be over-estimated.

THE KELVIN LECTURE

Not for some years has there been so "real" a Kelvin Lecture as the forty-first, delivered at the I.E.E. last week. It dealt in general with that branch of physical chemistry that is now called colloidal science and in particular with phase-boundary potentials and their significance in chemistry. Kelvin applied the Carnot cycle to many simple physical effects and he deduced therefrom formulæ and relationships which are leading to fuller understanding, for instance, of lubrication, the stability of alloys, porosity of materials and primary battery-cell activity.

Discoveries made at later dates could have been deduced from the application of Kelvin's formulæ if their full significance had been appreciated sooner than it was.

Electrical Development

Lord Citrine on Continued Handicaps

The Rt. Hon. Philip Noel-Baker, Minister of Fuel and Power, speaking at last week's E.D.A. luncheon

THERE was a company of about 500 at last Friday's annual luncheon of the British Electrical Development Association, held at the Connaught Rooms, London, W.C.2. Lord Citrine, president of the Association, was in the chair and Mr. Philip Noel-Baker, Minister of Fuel and Power, who was the principal guest, proposed the toast of the Association.

Mr. Noel-Baker said that he had been a friend of Lord Citrine's for many years and he knew that Lord Citrine would make a success of any job which he undertook. In a reference to Dame Caroline Haslett, he expressed the hope that more women would gain high executive positions in the electricity supply industry.

Activities Commended

He considered the Association's annual report to be a model of clarity and conviction and he commended the activities of E.D.A. in spreading the use of electricity, which brought prosperity and happiness to the people. He noted that the consumption of electricity had doubled since 1938, and it was supplied at less than the pre-war price.

As Minister of Fuel and Power, dirty coal was his greatest problem. It was a result of the shortage and there was a need for good coal for certain uses at home and for export. The electricity supply industry was helpful in this respect, for 65 per cent of power station supplies—16 million tons a year—was of the lower grades.

At present over 80 per cent of the coal used went up in smoke. An improvement of 10 per cent in efficiency would save 60 million tons a year. The electricity supply industry had made a great contribution by raising efficiency from 15.54 per cent in 1920 to 21.15 per cent in 1948-49. In the last few years the loss of electricity due to unsuitable fuel had been reduced by two-thirds.

Peak loads remained the industry's great problem and its task was to make consumers "peak conscious," persuading them to avoid the peaks but to make the fullest use of electricity at other times. This was not merely a temporary accommodation but a permanent need; every kilowatt of plant must be used to the utmost. There was scope for new appliances and methods for storing heat during off-peak hours. There was one such appliance for the provision of hot water. He used it himself and hoped that others would do the same. The night charging of electric vehicle batteries was a good off-peak load. These vehicles were clean and noiseless and saved imported fuel.

In a reference to gas, Mr. Noel-Baker said that competition was vitalizing, but it should not be of a "cut-throat" nature. Both gas and electricity should be sold at prices which covered their costs of production. He concluded by asking the industry to regard his Ministry as a partner.

Expansion Despite Handicaps

Lord Citrine responded to the toast. He referred to the hard work and service of many of those present which had brought the industry to its present position. The number of consumers had risen from 600,000 in 1919 to 12,600,000 to-day; despite handicaps, steady expansion had characterized the industry throughout its existence. In the last two years 900,000 consumers had been added; that number could have been doubled but for the restrictions. There was no sign whatever of "saturation" in any foreseeable period. At present they were working on a cumulative increase of 6 per cent. The maximum load had increased from 8,921 MW in 1947-48 to 11,035 MW in January last; it had been met largely

by increased operational efficiency and despite the use of ageing plant.

It was difficult to operate restrictions equitably, and the restrictions had lost the B.E.A. an immense amount of consumer goodwill. Industrialists were restive at load shedding, although the periods had been shortened. They did not know how long it would have to be continued.

Plant shortage was being gradually overcome, but the installation of plant was far below the expectations of those responsible for the industry before nationalization. Programmes had not been realized; they aimed at the installation of 1,600 MW in 1949 but less than half had been achieved. It appeared to be beyond the capacity of the British manufacturing industry to meet the demand. The B.E.A. had made desperate efforts to increase productive capacity but they had been forced to buy abroad to augment their supplies of valves and tubes. They had endeavoured to secure boiler plant from the United States, but although that country had ample capacity, and in spite of the time and effort they had spent, this plant was not yet in sight. It was not good from the price point of view for buyers to have to go about seeking supplies.

As time went on the new productive capacity which they had found would have its effect. Everybody recognized that electricity was vital to industry, but they were handicapped by being confined to their own resources. Last year generating capacity in the United States had risen by 6,647 MW. This country's modest programme had been curtailed to 1,500 MW a year by the Government. If they were confined to this it would be many years before supply caught up with demand. If any further cuts were made in their programme it would be disastrous for British industry.

Danger of Over-Planning

The public was getting sick of delays and he was tired of having to tell people that they would have to wait for the full supply they needed. The result was that blame was being placed on the blameless. He realized the need for a planned economy but there was a danger that the electricity supply industry would be planned out of existence.

Lord Citrine insisted that the consumer must have freedom of choice and this must be preserved in any measures of co-ordination. The people must be allowed to move with the times. No industry offered greater possibilities of an improved standard of life than electricity supply.

Serious Effect of Cuts

The health of the guests was proposed by Mr. R. A. S. Thwaites, chairman of the E.D.A. Council, who mentioned the presence of the Minister of Works (Mr. R. R. Stokes) and the Minister of Town and Country Planning (Dr. Hugh Dalton); he expressed the hope that the latter would expedite the granting of permits for overhead lines in which there was now too much delay.

Mr. Thwaites claimed that no industry had such a record of reduced prices as electricity supply and stressed that electrical development was essential to the country's survival. For this reason the cuts in capital expenditure were serious, particularly as they affected development in rural areas. This year's expenditure on distribution had been cut from £40 million to £35 million, although the higher figure was below what the Electricity Boards considered essential. On the other hand, the gas industry was being permitted to spend £2 million more than last year.

People on new housing estates needed cookers and other appliances. The cost of many of these had been inflated by purchase tax and they could only be acquired by hire purchase. Capital cuts would put a severe limit on the quantity of such appliances which the Boards could offer to consumers. Lighting revenue alone would not give a sufficient return upon the capital expended; means must be found of enabling consumers to use electricity for other purposes. Moreover, unless appliance manufacturers were assured of larger sales in the home market they would be unable to compete in the export market.

There was no foundation for the belief that electric cookers added appreciably to the peak load; the average was only about 200 W.

Mr. Thwaites then made mention of the E.D.A. Testing House which, he said,

aimed at raising the quality of British electrical appliances.

He concluded with a reference to the immense amount of arrears which the industry had to cope with. The cuts in expenditure would leave very little for extension of supply and provision of appliances. But the industry had a duty to the farmers, the industrialists and the housewives to whom electricity supply and electrical appliances were vitally necessary. These must be provided up to the full limit of available labour and material. If they were given the money they would do the job.

Sir Vincent de Ferranti (president of the British Electrical Power Convention) replied on the guests' behalf. He said that for thirty years the Electrical Development Association had had the wholly beneficent job of teaching people to use electricity; he paid a compliment to Mr. V. W. Dale, the general manager and secretary, for his work. There was much

(1) Lord Citrine and Sir John Kennedy. (2) Lady Citrine and Mr. R. A. S. Thwaites. (3) Mr. G. Leslie Wates, Dame Caroline Haslett and Sir Vincent de Ferranti. (4) Dr. Hugh Dalton with Lord and Lady Citrine. (5) Capt. J. M. Donaldson and the Dowager Lady Swaythling. (6) Mr. R. R. B. Brown, Mr. V. Pask and Mr. G. A. Vowles

to do to keep the electricity service up to scratch. Our factories needed modernizing and electrification would help more to make the railways solvent than an increase in the petrol tax. He thought the aim should be 6,000 kWh a year per consumer, equivalent to 270,000 million kWh a year. Sir Vincent mentioned the proposal of the North Eastern Electricity Consultative Council that the B.E.A. should search the Continent for plant and said that already 400 MW of generating plant was awaiting accommodation in power stations. In addition, the manufacturers were still exporting considerable quantities of plant. He wished E.D.A. every success in its work of bringing about the greater use of electricity and making it available.

Annual Meeting

Mr. R. A. S. Thwaites presided at the subsequent annual meeting and after the usual formalities called upon Mr. E. R. Wilkinson, Chairman of the Finance Committee, to present the accounts for 1949. Mr. Wilkinson referred to some of the principal points, mentioning, *inter alia*, that advertising had accounted for the greater part of the increase in expenditure. Exhibitions and displays had also involved more, largely because of the Association's participation in a greater number of agricultural shows. He said that most of the equipment which E.D.A. was providing for domestic science education had now been delivered. Adoption of the accounts was seconded by Mr. H. H. Mullens.

The report for the past year (see below) was presented by Mr. Thwaites, who said the Council had decided to embark upon a campaign in the Press of a number of industries. He referred to the success of the E.D.A. conferences and to the high standard attained by the finalists in the public speaking competition. The Association had had satisfactory negotiations with Government Departments on a number of matters. The Trolley-bus Committee had been revived, under the chairmanship of Mr. Edward Jones. During the year the reconstituted Area organization had continued to function and the North of Scotland Hydro-Electric Board had appointed a liaison officer to keep in contact with E.D.A.

In seconding the adoption of the report, Mr. Wilkinson said that the Association must now adopt a more positive policy in development.

Announcing the acceptance by Lord Citrine of the presidency for a further year, Mr. Thwaites expressed the Association's thanks to Lord Citrine and in seconding this Mr. C. T. Melling referred with approval to Lord Citrine's fighting speech at the luncheon.

A vote of thanks to Mr. Thwaites was proposed by Mr. Wilkinson, who said that in spite of his heavy work in the North Western Area Mr. Thwaites had devoted much time to the Association and had guided the Council in an admirable fashion.

Mr. H. Nimmo seconded the vote and Mr. Thwaites briefly acknowledged it, thanking Mr. Wilkinson and the other members of the Council and Mr. Dale and his staff.

Mr. L. Howles moved and Mr. C. R. King seconded the customary vote of thanks to the chairmen and members of E.D.A. Committees and the technical Press.

At a subsequent meeting of the Council Mr. E. R. Wilkinson, commercial manager, British Electricity Authority, was elected chairman for the ensuing year and Mr. C. T. Melling, chairman of the Eastern Electricity Board, was appointed vice-chairman.

Report for 1949

A comprehensive survey of the Association's work during 1949 is presented in the Council's annual report. In the introduction it is said that electrical development remained under a cloud, emphasis having to be placed on economy and the discouraging of demand. Yet, the continued existence of a more than ever active E.D.A. is one of the best expressions of the industry's faith in the future when the power load could be doubled and the domestic load quadrupled.

Regional organization came under con-

See opposite page: **(1) Mr. H. J. Randall with Mr. and Mrs. E. R. Wilkinson and Mr. Harold Hobson. (2) Mr. J. N. Waite, Mr. and Mrs. R. A. S. Thwaites and Mr. E. A. Mills. (3) Mr. E. C. Holroyde, Sir John Dalton and Mr. H. Nimmo. (4) Mr. A. B. Wildsmith, the Hon. J. R. Rea and Mr. J. M. Hollander. (5) Messrs. P. H. DeKeyser, F. Newey and J. L. Robinson**

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sideration and it was decided that Area Boards should provide machinery for liaison with the Council and for dealing with E.D.A. matters in their areas, the type of machinery to be at each Board's discretion. Where Area Boards were prepared to adopt quasi-independent Committees for these purposes they should be free to do so but still maintain liaison with the Council.

With the exception of those in the North Eastern Area and Northern Ireland the Area Committees were dissolved as at 31st December last. Provision has been made for the future employment of the Area staff. The Council expresses the opinion that there should be representation of the Generating Divisions.

During the year the Jersey Electricity Co. and the States of Guernsey Electricity Board were enrolled as members.

Press activities during the year are reviewed at some length. In a reference to film work it is stated that seven new educational films were produced; the first of a series of cookery demonstration films is being issued shortly; and three films for farmers were in the final stages of production at the end of the year.

The variety of exhibitions in which E.D.A. participated is seen from this section of the report which also mentions the Association's area exhibition and window display service. In conjunction with Area Boards stands were arranged at 27 agricultural shows.

Among other negotiations with Government Departments, representations were made to the Ministry of Health regarding a "directive" restricting the installation of electric cookers to supplement solid-fuel cookers in new local authority houses. The Ministry agreed to circulate a further notice indicating that this would not apply where the additional load could be dealt with. Endeavours were made to secure the reduction of purchase tax on electric water heaters.

The Association's activities extended to a wide variety of other matters, including the Festival of Britain, the Building Research Station, street lighting, electricity in schools, kitchen planning and catering training.

Among subjects dealt with by the Cooking Sub-Committee was the revision of the E.D.A. Specification for Interchangeability of Replacement Parts for Electric Cookers and the testing of cookers. The work of the Water Heating Sub-Committee included an investigation of instantaneous resistor-type water heaters. The opinion was formed that the heaters so far submitted for examination were not satisfactory and in view of this and their small water flow their adoption was not recommended.

Brief reports are given of the work of the Refrigeration, Street Lighting and Rural Electrification Advisory Committees and of the E.D.A.-B.S.I. Advisory Committee on Electrical Appliances & Accessories under whose auspices the Testing House did considerable work during the year.

The activities of the Area Committees, the Electric Vehicle Committee and the Electrical Association for Women are dealt with *seriatim* in an appendix to the report.

Safety at Sea

A PUBLIC exhibition entitled "Safety at Sea," sponsored by the London Transport Executive in collaboration with the G.P.O. and the Marconi International Marine Communication Co., Ltd., was opened this week at Charing Cross London Transport Station by the Rt. Hon Alfred Barnes, Minister of Transport. The theme of the exhibition is the development of wireless for the use and safety of those at sea and the progress made in communication equipment and radio aids to navigation in the past fifty years. The exhibition will be open from 10 a.m. to 7 p.m. daily, Sundays excepted, until 20th May.

The second course to be arranged by the British Council on "Safety at Sea," which opened in London on 18th April, is being attended by twenty maritime officials from Denmark, Finland, France, Italy and the Netherlands. The Ministry of Transport co-operated in arranging the programme, the first week of which was spent in London. It included lectures on the administration of marine safety and visits to Trinity House engineering workshops, a radar training school, Lloyds and the Shipping Division of the National Physical Laboratory at Teddington.

The second week of the course is being spent in Liverpool, where lectures are being given on pilotage, navigational aids, radar, salvage, buoys, fire-fighting and rescue work. There will be practical demonstrations of devices for marine safety, and visits to the manufacturers of safety equipment, ships' instruments and signalling devices.

VIEWS on the NEWS

By REFLECTOR

OF what value in civil life are Service qualifications? The question is prompted by a letter received from a man who has left the Navy with trade certificates relating to electrical work. He was a leading torpedo operator in sole charge of the operation and maintenance of the electrical plant and equipment in a frigate —generator, switchgear, wiring and accessories. He wants to know whether his certificates are acceptable to civilian employers and this raises a very wide question. It seems to me that some Service training and experience would be of value outside the Navy, Army and Air Force but the difficulty is in deciding what sort of training and experience. I wonder if any of my readers have views on the subject?

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Although the views expressed by the Minister of Fuel and Power at the E.D.A. lunch on the merits of electric vehicles were most encouraging, I thought the comparison he drew between the effects of purchase tax and the recent increase in the price of petrol was not too happy. Discussing the point afterwards with Sir John Kennedy, that unremitting advocate of electric transport in all its forms, I found he had made a rough calculation which somewhat took the sheen off Mr. Noel-Baker's remarks. Taking purchase tax at one-third of, say, £500 as the price of an electric vehicle, and fuel consumption of a petrol lorry at 15 miles to the gallon, a run of nearly 70,000 miles would be necessary to strike a balance between £166 and 9d a gallon.

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Alleged price-cutting by the South Eastern Electricity Board at Croydon was mentioned in my notes of 7th April. It had been said at a meeting of the local Chamber of Commerce that the Board had sent six men to put in an immersion heater and had charged only £18. The accusation of unfair trading has been replied to by Mr. A. L. Burnell, the Board's secretary. He does not deal with the specific case, however, but draws attention to the statement in the Board's first annual accounts showing the allocation of revenue from the installation department as follows: Direct costs 79.4 per cent; indirect costs 12.8 per cent; surplus 7.8 per cent. He points out that the Board has no corresponding figures for the local electrical contractors.

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Perhaps I may be forgiven for referring once more to the "Clow" surcharge affair. It is reported that a consumer in the South West Scotland Area who was compelled to live in a Nissen hut used his fires rather freely during the surcharge quarter and the result was a £6 increase in his bill. Later he moved to a house in which electricity was not available. Thus he ceased to be a consumer and lost his entitlement to the rebate, apart from £1 which accrued to him before he moved. The Board has refused, or is unable, to refund any more but the victim is claiming a balance of £5 which he says is due to him. It is a nice problem but perhaps the Prime Minister, the Minister of Fuel and Power and the local Member of Parliament to whom he is writing will be able to settle it.

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From New York it is reported that a talking traffic signal has been installed which warns pedestrians and motorists to be careful. It advises the pedestrian, for instance, to "Avoid that run-down feeling," but this is only one of six sage sentences which are trumpeted forth at the rate of one in 40 seconds—each time the traffic lights change. I should imagine that this distraction is more likely to increase accidents than decrease them and is certainly not one of the American ideas which we should copy.

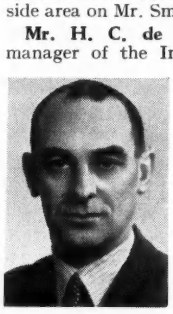
PERSONAL and SOCIAL

News of Men and Women of the Industry

THREE apprentices of **Marconi's Wireless Telegraph Co., Ltd.,** have gained awards in the Physical Society's 1950 craftsmanship and draughtmanship competition for apprentices and learners. They are Roger Pallemaerts (extra prize, Class 1 (b)), George Brown (first prize, Class 6), and Peter Haley (honourable mention, Class 6).

Mr. J. S. Smith, Liverpool, north-western area manager of the Marconi International Marine Communication Co., Ltd., since 1947, is retiring from active service at the end of this month, and will act as consultant to the company for six months before finally retiring. Before becoming Liverpool depot manager he was in charge of the Marconi Marine depot, in New York. **Mr. H. C. Maguire,** the company's contracts representative in Glasgow, will move to Liverpool to take over contract work in the Merseyside area on Mr. Smith's retirement.

Mr. H. C. de Vroome, until recently manager of the Insulation Department of Lewis Berger & Sons, Ltd., has resigned his position to form a new company, Devroome Developments, Ltd., specializing in the production, sales and extended development of "Ulti-meg" electrical insulation materials. Mr. de Vroome was responsible for much of the pioneer work on modern high-speed synthetic impregnating varnishes, and has carried out considerable work on high temperature insulation and automatic conveyor impregnating processes. Before joining Lewis Berger & Sons, Ltd., he was for some years chief chemist at the Sterling Varnish Co., Ltd. Devroome Developments, Ltd., has acquired offices at Crompton House, Aldwych, London, W.C.2 (telephone: Holborn 2891).



Mr. H. C. de Vroome

Mr. Edgar R. Wilkinson, M.I.E.E., M.I.Mech.E., the newly appointed chairman of the British Electrical Development Association, is the commercial manager of the British Electricity Authority. Mr. Wilkinson received his early technical training and works experience at the Dick Kerr Works, Preston, and subsequently went to the Willans Works, Rugby, after their absorption into the English Electric Co.

At this early period of his career he was attracted to the subject of power station design, operation and costs. In 1924 he joined Merz & McLellan, consulting engineers, and in that year took an active part in the preparation of the first of a series of standardization of frequency reports for the Government. In 1925 he was engaged on work for the Advisory Committee of the Weir Committee and, in 1925-26, on a report, for the Government, on national electricity supply. He was also engaged on a number of power supply projects for various parts of the world. In 1928 Mr. Wilkinson joined the Central Electricity Board as deputy to the commercial manager, and, in 1937, became commercial manager. With the passing of the 1947 Act, he became commercial manager of the British Electricity Authority.

Mr. F. Byrne, A.M.C.T., A.M.I.E.E., previously metering engineer to the London Division of the British Electricity Authority, has been appointed plant specialist (meters) at B.E.A. headquarters. Mr. Byrne was metering engineer in the South-East and East England Districts of the C.E.B. from its inception, and before that was with the Salford and Bury electricity undertakings and with Mather & Platt, Manchester. He received his technical education at the Manchester College of Technology and his training with Ferranti, Ltd. He was the author of a recent I.E.E. paper entitled "A Survey of Metering Practice on the British Grid System." During the 1914-18 war he served with the R.F.A. and the R.A.F.

Mr. D. B. Battle, a technical engineer at the Witton Moulded Insulation Works of the General Electric Co., Ltd., has been awarded a two-year scholarship to study industrial management in the United States. The scholarship is one of fifty just awarded by the Economic Co-operation Administration and is worth $3,600. Mr. Battle hopes to carry out his studies at the Harvard Graduate School of Business Administration and in selected American manufacturing concerns. He is an honours graduate of Bristol University and during the past three years has undertaken post-graduate studies of industrial management

in the new Department of Industrial Administration of the Birmingham Technical College. He plans to leave for the United States in September.

C. A. Parsons & Co., Ltd., announce that **Mr. A. McLean,** until recently a local director of Barclays Bank, Ltd., Newcastle-upon-Tyne, has been appointed to their board of directors.

Sir Percy H. Mills, K.B.E., managing director of W. & T. Avery, Ltd., was re-elected president of the Institute of Industrial Supervisors at the recent annual meeting of the Institute, and **Mr. H. R. Harbott,** chairman of the Smethwick Section, was elected chairman of the Council.

Mr. W. Walker has been appointed Middle East representative to B. French, Ltd., and has left this country to take charge of a contract which the company is carrying out in connection with the electrical work at the new docks and customs office at Jeddah, Saudi Arabia. Mr. Walker has an intimate knowledge of the Middle East and served in the Iraqi Air Force during the war. Since joining B. French, Ltd., he has been second in command on the electrification of the Brabazon hangar at Filton.

Air Commodore Sir Frank Whittle, K.B.E., C.B., F.R.S., has agreed to act as a consultant to Power Jets (Research & Development), Ltd., in all matters relating to gas turbines except in the field of civil aviation. Sir Frank has accepted this appointment with the concurrence of the board of British Overseas Airways Corporation, to which he will continue to act as honorary technical adviser on jet development.

Colleagues of **Mr. W. H. Steele,** A.M.I.E.E., control superintendent, St. Paul's grid control area, British Electricity Authority, who has been suffering from failing eyesight, will be glad to know that following on two major operations a complete recovery has been assured.

At the E.D.A. annual meeting last Friday Mr. R. A. S. Thwaites referred to the injuries sustained by **Mr. Norman Phillips,** the Association's exhibition organizer, when his home was destroyed by fire. It was decided to send Mr. Phillips a message from the meeting expressing the hope of his early complete recovery.

Mr. E. M. Packham, A.C.C.S., deputy secretary of the London Division of the B.E.A., has been appointed secretary in succession to the late Mr. B. Higgins.

Mr. H. W. Heyman, B.Sc., A.M.I.E.E., who is managing director of Smith's Electric Vehicles, Ltd., has been re-elected to the Council of the Society of Motor Manufacturers and Traders, Ltd., as the representative of the Battery Electric Vehicle Section for the year 1950-51.

Bylock Electric, Ltd., announces that **Mr. W. J. Cakebread,** A.M.I.P.E., A.M.I.I.A., late production manager of the Croydon Engineering Co., Ltd., and production engineer of the Plessey Co., Fractional Horse-Power Motor Department, has joined its Motor Design Section.

Mr. E. Woolgar, power station superintendent at Tunbridge Wells, retired at the end of March after twenty years' service at the station. On his retirement he was presented with an electric clock and a desk light, the presentation being made by Mr. J. L. Rooney (generation engineer operation), South Eastern Division, B.E.A.

Mr. A. J. Crouch retired from the Glasgow branch of Falk, Stadelmann & Co., Ltd., on 17th April after fifty-one years' service. Mr. Crouch joined the company in 1899 in London and went to Glasgow in 1905. He has been presented with a wallet of notes from his colleagues on the office and warehouse staff. The presentation was made by Mr. C. J. Gregg, director.

The Council of the Electrical Research Association has appointed **Dr. W. B. Whitney,** M.Inst.C.E., M.I.E.E., to be Assistant Director of Research under Dr. S. Whitehead. Dr. Whitney joined the E.R.A. at its inception and has been in charge of the researches on switch and control gear which position he is retaining. He was mainly responsible for the invention and development of the gas blast circuit breaker and the side blast baffle, which types comprise a very large proportion of the heavy power circuit breakers now in use.

Mr. G. L. Wates (Johnson & Phillips) is the new chairman of the B.E.A.M.A. Council, and **Mr. I. R. Cox** (Metropolitan-Vickers) is vice-chairman.

The annual snooker handicap final of the **Birmingham Electric Club** was played at the Grand Hotel, Birmingham, on 17th April, Mr. F. Westerman (F. Westerman (Wholesale), Ltd.) winning from Mr. J. M. Surrall (Simplex Electric, Ltd.). Mr. H. M. Barker (A. Reyrolle & Co.) won the prize

"ELECTRICAL WHO'S WHO"

The "Electrical Who's Who," containing brief biographies of prominent people in all branches of the Industry, is now obtainable (price 12s. 6d., postage 6d.) from the *Electrical Review*, Dorset House, Stamford Street, S.E.1, and booksellers.

for highest score. The cup was presented by Mr. J. Ashmore, president of the Birmingham Electric Club, at the meeting which followed. The paper "A Layman Looks at Long Distance Transmission and its Possibilities" was given by the Earl of Verulam.

To celebrate the 25th and 21st anniversaries respectively of **Arthur Ford, Ltd.,** and **Wilson Ford, Ltd.,** two well-known Nottingham electrical concerns, their employees and friends were entertained to a dinner dance at Daybrook House, Nottingham, on 22nd April. Mr. Arthur Ford presided over the company of 120, supported by Mrs. Ford, and Mr. G. D. Scions, directors, and Messrs. Brian and John Ford.

After holding the Middlesex Lunch Time Netball League Division 1 championship cup for two years running the **General Electric Co., Ltd.,** lost to the Cable & Wireless team by 11 goals to 5 in the final held at Lincoln's Inn Fields on 19th April.

OBITUARY

Major Sir Hubert W. Young.—The death has occurred at Evora, Portugal, while on holiday, of Major Sir Hubert Winthrop Young, a member of the Southern Electricity Board and chairman of the Consultative Council for that area. He was sixty-four.

Mr. C. M. Read.—The death occurred recently, at the age of seventy-four, at Ashurst, Southampton, of Mr. Charles Macartney Read, who was for many years the district engineer of Pirelli-General Cable Works, Ltd., in South East England and East Englia. Mr. Read served in the Malta Government Electricity Department and subsequently in South Africa, where he became chief engineer to the Cape Peninsular Electric Lighting Co.

WILLS

Col. Sir Thomas Fortune Purves, O.B.E., M.I.E.E., for some years director of the Cable Makers' Association, who died on 29th January last, left £10,482 gross (£10,357 net).

Lord Pender, for many years chairman and managing director of Cable & Wireless, Ltd., who died on 4th Dec. last, intestate, left £49,065 gross (£41,651 net).

Mr. R. A. Fulford, chairman and joint managing director of Marco Refrigerators, Ltd., and a director of Sunvic Controls, Ltd., who died on 3rd Oct. last, left £53,622 gross (£39,997 net).

Mr. J. E. B. Adams, managing director of John Adams, Ltd., electrical contractors, Manchester, who died on 30th Oct. last, left £2,484 gross (£2,363 net).

NEXT WEEK'S EVENTS

Monday, 1st May

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Centre. "Some Electromagnetic Problems," by Prof. G. W. O. Howe. (Joint meeting with the South Midland Radio Group.)

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "Power System Stability," by K. W. Wardrop.

Tuesday, 2nd May

BELFAST.—Wellington Hall, 7.30 p.m. I.E.E. Northern Ireland Centre. Faraday Lecture on "Radar," by Dr. R. A. Smith.

LEEDS.—Y.E.B. Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. Annual general meeting.

LIVERPOOL.—Mersey and North Wales Electricity Board's Showroom, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. Annual general meeting, followed by a "Brains Trust."

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement Section. Annual lecture. "Recent Ideas and Experiments in Magnetism," by Prof. L. F. Bates.

Caxton Hall, Westminster, S.W.1. British Electrical Development Association. Sales Management Conference. (Continued on 3rd, 4th and 5th May.)

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. Annual general meeting. "The Continental Development of Single-Anode Mercury-Arc-Rectifier Valves for High Power," by H. Von Bertele.

SOUTH HARROW.—St. Hilda's Hall, 8 p.m. A.S.E.E. North-West London Branch. Members' electrical exhibition.

Wednesday, 3rd May

LIVERPOOL. — Accountants' Hall, Derby Square, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "History and Development of Rediffusion Systems," by M. Exwood.

LONDON.—I.E.E. London Students' Section, 2 p.m. Visit to Johnson & Phillips, Ltd., Charlton, S.E.7.

SOUTHAMPTON.—University College, 6.30 p.m. I.E.E. Southern Centre. Annual general meeting. "Electrical Weighing," by Dr. H. I. Andrews. (Joint meeting with the Southern Branch of the Institution of Mechanical Engineers.)

Thursday, 4th May

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "Evolution of the Lighting Art," by J. W. T. Walsh.

Saturday, 6th May

LEEDS.—Y.E.B. Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Annual general meeting.

LONDON.—I.E.E. London Students' Section, 10.30 a.m. Visit to Abinger Magnetic Station, near Dorking.

ELECTRICAL CONTRACTING:

ORGANIZATION AND ROUTINE

By H. R. TAUNTON, A.M.I.E.E.

1—*How to Begin*

TO become an electrical contractor is easy. Too easy. To become one and remain one, however; to establish a footing in a highly competitive trade and maintain it with good repute: that calls for no common qualifications. That is as it should be; for, despite all that the jerry wireman does to lower its status, the trade of electrical contracting is a highly skilled one, an important branch of the building industry, touching more closely than almost any other the convenience and safety of the community.

Its importance, too, is increasing with every year. Once electrical contracting was mainly a matter of lighting, its technicalities simple and largely rule of thumb. It was a luxury, with a demand limited to the few who could afford it.

This article is the first of a series based upon Mr. Taunton's book bearing the same title. The information given should be of great practical value to all those in the electrical contracting industry.

To-day electricity is an essential of existence and the field of contracting has widened in directions undreamed of forty years ago. The all-electric house has become a reality, with lighting, heating, cooking, cleaning—everything done by electricity. The switch-room of a modern building—a block of offices, a big store, a theatre, a hospital—controls a wattage which once would have served the needs of a small town.

That is one side of the question: the vastly increased field in which the modern contractor can operate. But its promise has naturally attracted other operators: chiefly the electricity supply authorities and the builders.

The Electricity Boards' schemes of assisted wiring and hire purchase of apparatus, inherited from the old companies and many municipalities, are mainly intended for the benefit of small consumers and so chiefly affect the smaller contractors, inasmuch as such activities are generally beyond their financial power.

The bigger firms, who depend for their turnover on the wiring and special equipment of buildings requiring large and complex installations, should be little affected. The competition they have to face comes from the big building contractors, a number of whom have developed electrical departments, sometimes as subsidiary companies, giving them obvious advantages over a sub-contractor.

But a modern electrical installation is something more than building work. It is engineering work, requiring the skill and experience of a specialist. No general contractor can legitimately claim to be that, in the one sub-contract which is the most technical of them all. The electrical contracting firms of the future will hold their own by making themselves indispensable specialists.

Qualifications Necessary

To do this calls for qualifications of no common kind, qualifications of character, training and material assets. The better equipped with them, the better the beginner's chance of securing a footing in the industry against not only outside competition but that, equally fierce, of specialists of long standing. He is fighting for a place among some 10,000 pre-comers: a rough estimate of the number of existing electrical contractors —good, bad, and indescribable.

As to training, there is much to be said for that of a wireman, backed by a good general education and supplemented by a thorough technical course. The youth whose vocation is electrical contracting, either as a principal or a manager, will do better to become an apprentice with a good firm handling large and varied work, taking evening classes in technology, than to become a pupil in an engineering works or a technical college. Everything he learns will be of practical use to him when he comes later to estimate and supervise; he will gain inside knowledge of the wireman's tricks, good and bad; and, as important as anything, he will come to an understanding of, and sympathy with, the class of men whom in due course he will himself employ or control.

Moreover, his objective being what it is, he will be given opportunities in the office, the stores, and at the drawing-board of gaining some experience of the commercial side of the business, without which he would be, later, as much at the mercy of his clerical staff as, without the other, he would be at the mercy of his foremen.

At the end of his time he will do well to sit for some such examination as the City and Guilds, or the student membership of the Institution af Electrical Engineers, ensuring a satisfactory standard of technical knowledge.

After Training

With so much training he has now a solid foundation on which to accumulate the wider knowledge and experience essential to permanent efficiency which, normally, unless he has money or influence behind him and enters easily some relative's business as junior partner, he will next gain as a salaried employee, before he branches out in business for himself. For that he will need capital.

How much? The obvious answer is as much in reason as he can get. The more money he has behind him, the higher up the ladder he can make his start, and the better his chance of climbing it. Let us suppose, as is commonly the case, he is an electrician who, after some years, decides to realize an ambition to become something more than a charge-hand. For the satisfaction of being "on his own," he is content to make the humblest of beginnings. He will be prepared to work with his hands, with a mate to help him on small jobs, or as his own foreman on larger ones. He will conduct his correspondence and do his book-keeping himself in the evenings. He will have no initial stock, and no plant beyond his old kit of tools and a few essentials. He will rent a single office or small store in a provincial or suburban back-street, or he may make shift with a room or shed attached to his dwelling.

Danger of Inadequate Resources

But he has a hard row to hoe. Few succeed in reaching the end of it, and it is becoming every year more difficult. In any case, the attempt is to be deprecated. With the best intentions to do sound work at fair prices, the beginner with inadequate capital is all too apt to become, by force of circumstance, the jerry wireman, the curse of the trade.

To go to the other extreme, let us imagine now a contractor's engineer or manager who finds himself with £10,000 in the bank, thanks to a departed aunt or a lucky football coupon—he is hardly likely to have saved it out of his pay. He decides to launch out for himself; and he can afford to do it in style.

He can rent good offices and stores, furnish them well and stock them liberally. He can engage at once an adequate staff, and he can afford to advertise. His standing charges will be comparatively heavy from the first, but he knows—to take an absurd case—he can hang on for several years even if he does not get a single order. He has every chance of establishing himself as a respected member of the trade, not because he is necessarily a man of greater integrity than the poor wretch we have doomed to jerry-wiring, but simply because he is not exposed to the same temptations.

£10,000 is a pleasantly safe sum with which to start, but something between £500 and £5,000 is a likelier figure. It will suffice according to the scale on which it is proposed to work. That is really the determining factor. It would be folly, for instance, for a man with only £500 at the back of him to compete for a contract of £5,000 or so. If he secured it, he might exhaust the whole of his capital in wages and material before he could get a first payment on account.

As a rough rule, he should have sufficient capital to cover:

(*a*) *Initial Expenses.*—Legal fees, furnishing and decorating, plant and tools, special printing and advertising, and perhaps the first equipment of a showroom.

(*b*) *Standing Charges for a Year.*—Whether orders come in or not, these have got to be paid, and promptly. Neither rate-collector nor clerks will give extended credit.

(*c*) *Wages and Expenses for Three Months.*—In small jobs or large contracts, wages have to be paid weekly, while the contractor may have to wait months for his customers' money.

(*d*) *Material Costs for a Month.*—Here we can count on a certain amount of credit; but that may be limited by the fact that he is an unknown beginner.

(*e*) *And, Finally, a Subsistence for Himself.*—Until his business is so established that he can begin to draw on its surplus profits.

With this as a rough guide, each can expand or contract it as he is cautious or adventurous. He will do well to err on the side of caution.

Buying a Business

Qualified and with capital, he has now to decide whether to initiate an entirely new business or to buy an existing business or a share in one.

Safety and ease are the obvious recommendation for the last of these three possibilities. The fact that the principals of the firm are not selling their business outright is some indication that they themselves consider it has profit-making possibilities. The intending partner has only to satisfy himself that their faith in it is justified and that his prospective partners are men with whom he will be able to work comfortably—an important point that—and he has nothing more to do but to complete negotiations and pay down his money.

He who prefers to have a business under his sole control, can choose the second course of buying the whole of an established business; but he will have to exercise greater caution in his investment.

The question he must ask is, why does the vendor want to sell? It may be advancing age, or sudden affluence—excellent reasons; it may be ill-health, an excuse commonly given; but whatever the alleged reason, the true one is, as likely as not, dwindling profits and threatened collapse, the consequences of an exhausted area, or overwhelming competition.

The buyer may come to realize the worse aspects of the bargain he proposes to make, and yet decide that his new capital and his new methods, and, of course, his own unusual capabilities, can build up a weak concern again into a sound one. The sage counsels which might then be given him can be summarized in the old maxim *caveat emptor,* and only two need be particularized.

(*a*) The "goodwill" of a contracting business, of which so much is made when it comes to selling it, is almost invariably attached to the individual and not to the firm, and is not worth "tuppence" as a selling proposition, and less as buying one.

(*b*) Almost every advertisement of a contracting business for sale includes the mystic initials "S.A.V."—stock at valuation. What does that mean? If the figure is that of the seller's professional valuer it will be certainly over-optimistic. The purchaser himself, who is presumed to have the experience necessary, should decide for himself what the stock is worth to him, and pay for it no more than a near compromise.

Founding a New Business

Finally, consider the case of the man who, for one reason or another, prefers to found a new business for himself.

The first point to be decided will be the district and the locality. If a man has a personal connection, its locale will naturally decide that of his business. He may deliberately choose a district offering an unusual freedom from competition or a potentially rich field of operation; or he may simply follow a personal predilection or be influenced by nothing more than his wife's wish to be near her "people."

The district decided, there remains the choice of the best locality in it. Here again, but more intensively, the probable competition in it, and also his available capital, will decide the question for him. If he proposes to run a shop in connection with his contracting he will, within the limits of the rent he can afford, naturally look for it in the better shop-

ping streets of the town. If he is going to confine himself to contracting pure and simple, his choice is wider. Any decent address will serve him, as he need not study appearances and can concentrate primarily on working conveniences, centrality and ease of access for his men to bus routes.

Choosing Premises

He wants office accommodation and a store. It is not absolutely essential that the two should be together but even if they are no more than the width of the road apart, organization will be handicapped. Every effort, therefore, should be made to find an office with a suitable basement or back portion. If it has a yard attached, for the housing of bulky tackle, so much the better. The amount of office accommodation necessary depends on the staff to be housed, and that again on the scale of business.

As a positive basis for discussion, consider the case of an average firm prepared to take on contracts of any reasonable size, and aiming at a normal annual turnover of, say, £25,000 to £30,000. Such a firm will employ a staff with at least one representative of each of the grades discussed in the next article; and proportionate accommodation must be found for them.

The contractor will usually have to seek it in one of the older types of buildings, with three or four floors and, probably, no lift; so that, if his stores are in the basement and he can afford the first floor, he will prefer to take it. In a narrow-fronted building of small floor area he may have to take two or three floors. A vertical arrangement, however, is to be avoided if possible. As in the case of separated stores, it means lack of supervision and waste of time and energy on the stairs or the telephone. Wherever possible, all offices should be on the same floor and intercommunicating.

Staff Accommodation

The principal will naturally want a room to himself, as will his manager, if he employs one. If his second-in-command is solely an engineer, privacy is not so essential, and if he has an assistant he can well share the room with him. The drawing office completes the requirements of the technical staff, providing an alternative for the assistant.

The outside representative is, or should be, so little inside that he requires no special accommodation; nor does the chief foreman or supervisor. If the office is made too comfortable for these outside men, they are apt to linger in it, instead of getting out and about.

The accountant's department will probably consist of the book-keeper and one or two juniors. These obviously should work together in one room. Finally, there will probably be two or three typists, one of whom will act as telephone girl. They should have a room to themselves, if only that the gay apprentices shall have no temptation to dalliance.

Altogether, it will be seen that, apart from the stores the staff of an average contracting firm can be conveniently housed in from four to six rooms. They should be of fair size, with plenty of natural and artificial light, comfortably heated and ventilated, and neat and clean. The psychological effects of cramped quarters and minor discomforts, long continued, are too often overlooked. They inevitably mean lowered vitality, lassitude, irritability, and—if nothing else appeals to the employer—consequent lessened output. As to the best apportionment of the various rooms, the simple principle, not always observed, is that those should be nearest to each other whose routine brings them most into intercommunication.

Furniture and Equipment

There remain the questions of decorating, furnishing, and equipment. Various items of equipment—books, files, and whatnot—will be noted later as they arise in connection with the work of the various departments. Furniture is a matter to be decided by individual taste and the funds available. The commonest error of judgment in furnishing is in the floor coverings. While Persian carpets are certainly out of place, the bare boards so commonly seen in contractors' premises are quite as objectionable, noisy, dirty, and bleakly uncomfortable. The expense of a good floor covering, such as cork lino, will quickly be repaid, if only in the saving of labour to the charwoman. A room decorated on some light, cheerful scheme will, apart from

its tonic effect, show a definite saving in the electricity bill.

That brings us to where, perhaps, we should have begun: the electrical installation. Needless to say, this ought to be a model of its kind. (In practice, if you are looking for an illustration of a particular sin against the Wiring Rules of the I.E.E., you have only to look round the office installation of any well-established firm of contractors!) It should be preferably carried out on several systems to illustrate the talking points of each, with plenty of wall sockets, lighting and power, so that apparatus can be easily demonstrated or tested, and fires or fans used in their due season.

And now, preliminaries settled, our budding contractor has only to screw up his name-plate and begin business.

MOISTURE MEASUREMENT

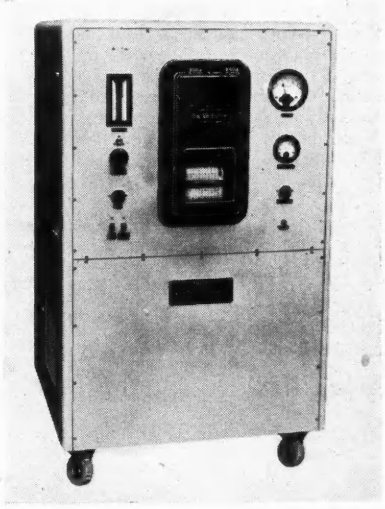
AN instrument which has recently been developed by Elliott Brothers (London), Ltd., utilizes a novel method of measurement which enables it to operate automatically and continuously and to provide a continuous chart record of dew-point. It will measure very dry air with dew-points or frost-points much below 0 deg C and, unlike other hygrometers, it requires no replacement of water absorbing materials, hygroscopic acids or salts. Two types are available, one for meteorological purposes and the other, which is of most interest to physicists and chemists, for industrial purposes.

In both instruments a jet of air, or gas sample, is directed on to the polished top surface of a thimble which is continuously cooled by contact with a copper block forming part of a refrigerator system. Light from a lamp and lens system is directed obliquely on the top of the thimble and dew formation is detected by two photo-cells, one adjacent to and illuminated by the lamp and the other so placed that it is unaffected by reflected light so long as the top of the thimble remains clear, but receives scattered light when dew or frost forms.

The photo-cell outputs are fed into a differential valve amplifier, which in association with a magnetic amplifier controls a heater system between the copper cooling block and the thimble. This arrangement maintains the thimble at a temperature at which dew just commences to form, i.e., the dew point of the sample. A thermocouple is embodied in the thimble and connected to a second magnetic amplifier from which sufficient power is derived to operate an indicating instrument and direct-writing recorder.

The apparatus is self-contained and housed in a cabinet with its own refrigerator for cooling the copper block. Unit construction of the various components and plug and socket connections have been used throughout simplify maintenance.

The industrial model has a range of dew points from −40 deg C to +20 deg C with an accuracy of 0.5 deg C and a time response of approximately 2 sec. It is suitable for use with air or non-corrosive gases at pressures of 20in water gauge above or below atmospheric. The meteorological version, which is designed for use in aircraft, is more compact, since the refrigerator is replaced by a supply of liquid oxygen which enables a range of dew points from −80 deg C to +20 deg C to be measured. Down to −40 deg C the accuracy and time response are the same as in the industrial type, with a slight reduction of performance at lower temperatures due to the exceedingly small quantity of water vapour present. At −80 deg C the accuracy is between 1 deg C and 2 deg C, while the time response is about 10 sec.



Elliott recording dewpoint hygrometer

NEW BOOKS

An Advanced Treatise on Physical Chemistry. Volume 1. Fundamentals. The Properties of Gases. By J. R. Partington, D.Sc. Pp. 943; figs. and index. Longmans Green & Co., Ltd., 6-7, Clifford Street, London, W.1. Price 80s.

This extremely well-produced book forms part of a comprehensive treatise on physical chemistry in three or four volumes and although it has the title "advanced," this refers rather to the size and scope of the work than its difficulty. The primary emphasis is on the experimental, and in addition to the many descriptions of apparatus and experimental methods there is a wealth of numerical data and other information which is not elsewhere easily accessible, being scattered throughout a large number of publications.

The book starts with a mathematical introduction and this is worthy of special mention because it has been compiled in such a way as to form a really good refresher course for all who have taken a degree. After this the author deals with thermo-dynamics and passes on to the kinetic theory of gases, statistical mechanics and the quantum theory, wave mechanics, temperature and thermometry. The final section of the book takes up 388 pages, in which the properties of gases are discussed in detail.

This book, which includes a large number of references to other literature, will undoubtedly be of great value to all who are interested in physical chemistry, but at such a high price its possession will perhaps be limited to libraries attached to research laboratories and the like.—R. P.

Communication Circuits. By L. A. Ware and H. R. Reed. Pp. 403; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 40s in U.K.

This book is intended for students familiar with elementary a.c. circuits as an introduction to the theory of transmission lines, filters and wave guides. With the exception of the chapters on wave guides, the treatment is general, being eminently suitable for use as a textbook by both telephone and high-frequency engineers, although the high-frequency aspects of the subject are particularly stressed.

The approach is necessarily of a mathematical nature, so a working knowledge of the calculus has been assumed. The more advanced mathematical processes which are required from time to time, and with which the average reader may not be conversant, are adequately dealt with in a number of appendices. Important points in the text are illustrated by means of worked examples and a selection of typical problems is to be found at the end of each chapter. Unfortunately, answers are not provided and the usefulness of the book would be greatly increased if this could be remedied in a future edition. In keeping with contemporary literature, the authors have used the rationalized M.K.S. system of units and although this may lead initially to minor inconveniences to those who are familiar only with the C.G.S. system the advantages of the former should be easily apparent.

In addition to its obvious uses as a textbook, practising engineers will find this work an invaluable aid to the speedy solution of many constantly recurring problems.—H. B. W.

Books Received

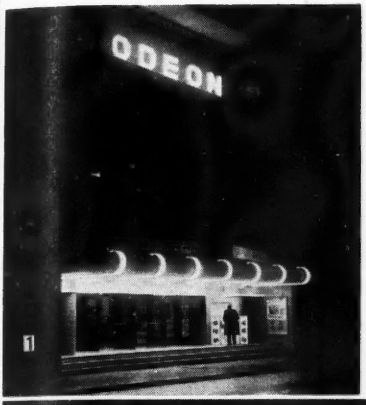
Materials Handling Manual (3). Edited by M. M. and G. W. Williamson. Pp. 364; figs. 257. Paul Elek (Publishers), Ltd., 38, Hatton Garden, London, E.C.1. Price 30s.

Thermodynamics Applied to Heat Engines. By E. H. Lewitt, Ph.D., A.M.I.Mech.E. Fourth edition. Pp. 758; figs. 295; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 30s.

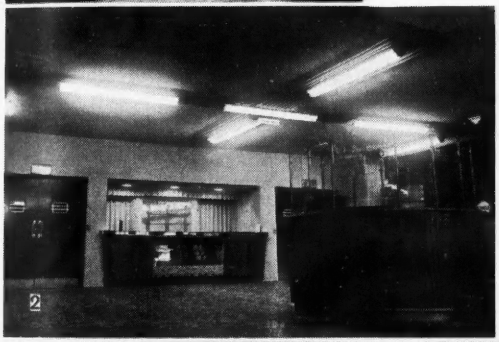
Questions and Answers on Electric Motors. By E. Molloy. Fourth edition. Pp. 120; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 5s.

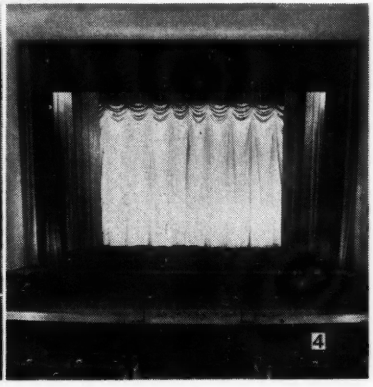
A Modern Cinema

Electrical Equipment at the New Worcester Odeon



AS the erection of new cinemas has been banned since the war, the opening of the new Odeon Theatre at Worcester is something of an event. Almost completed when war broke out, this cinema was taken over by the Ministry of Works in 1940 for use first by the Ministry of Aircraft Production for the storage of special alloys and later as a disposal stores for surplus Government goods. The theatre was de-requisitioned in September, 1947, and after extensive restoration and installation of furnishings and equipment, was opened for the first time for its original purpose in January. It can therefore be claimed to be the first new cinema to be opened since the early days of the war and as such to in-





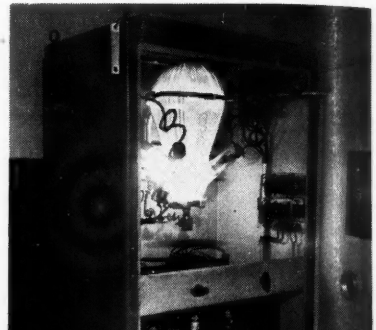
1.—Cold-cathode lighting illuminates the canopy, the Odeon sign being in red neon. 2.—Fluorescent tubes in tinted glass fittings harmonize with the decorations in the entrance foyer. 3.—Attractive pendant and flush ceiling fittings light the auditorium. 4.—Stage lighting is carried out by means of three-colour battens and floats

corporate the latest electrical technique.

Both outside and inside present a striking modern appearance. Seven banks of pink cold-cathode tubes in fluted members illuminate the entrance canopy, the electrodes being concealed in circular soffit features, which also accommodate behind frosted glass 100 W tungsten lamps for a secondary source of illumination. Thus no electrodes or cables are visible. Three specially designed floodlights, each housing two 40 W fluorescent tubes, light up the central feature of the elevation, the middle unit being blue and the other two red. The standard Odeon sign, which is silhouetted against a cream-coloured background, is red with a double outline of neon tubing.

For the entrance foyer ten 80 W warm-white "Mazda" fluorescent tubes in tinted glass fittings harmonize with the decorations and furnishings to create an impression of warmth. Over the confectionery and cigarette kiosk there are three soffit lights with 60 W lamps and there are two secondary ceiling lights each with two 25 W lamps. A contrast in lighting methods is achieved in the circle foyer by the use of six decorative amber pendants, each accommodating six 60 W tungsten lamps, and two wall brackets to match.

Illumination of the auditorium, which seats approximately 1,700, is provided by four attractive pendant fittings (eight 100 W tungsten lamps), eighteen wall brackets (15 W lamps), five semi-recessed ceiling fittings (six 60 W lamps), and three similar units at rear of balcony), as well as eight cleaners' lights totalling 1,200 W. The pendant fittings are supported on central stems which are partially sunk in mottled gold and red circular recesses which are carried out in fibrous plaster.



One of the two mercury arc rectifiers which supply direct current for the projectors and for the slide and general purpose arcs

Stage lighting is provided by three-colour battens and floats (sixteen 150 W lamps for each colour) as well as dips for portable stage floods and special effects. The auditorium and stage lighting is controlled from the projection room through a "Major"

The projection room showing the two B.T.H. "Supa" projectors, together with slide and general purpose arcs

dead-front dimmer panel. The screen curtains are operated by a remotely controlled ¼ h.p. motor and the main curtains by a ½ h.p. motor, and a festoon curtain is also provided which is hand operated. A multi-cellular dual-channel loudspeaker assembly is located in a special sound-damped chamber built into the back wall behind the perforated flat-white picture screen.

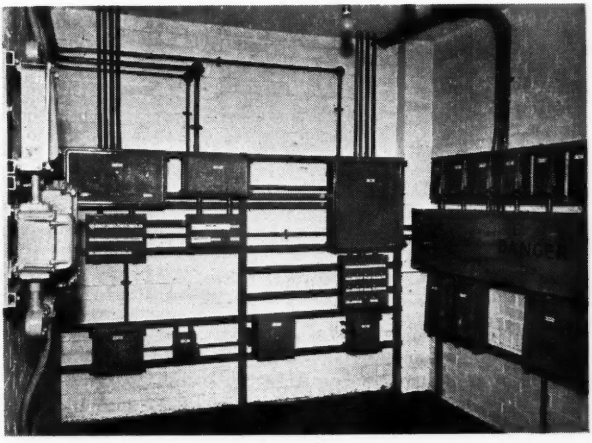
Probably the most striking feature of the projection room is that there are no conduit, switchgear or controls to be seen. This is due to the fact that the two B.T.H. "Supa" (single unit projection assembly) projectors employed have, as their name implies, all their controls embodied in the stands, an illuminated panel on each machine covering amplifier switching, motor and arc push-buttons, volume control and arc ammeter and voltmeter. Change-over of picture and sound is made automatically by a push-button conveniently placed for the operator to watch his cue marks.

The arc lamps incorporated in the "Supa" projectors are provided with exceptionally large diameter mirrors, automatic striking, electro-magnetic feeding systems of advanced design and automatic focusing control, thus ensuring adequate brilliance and consistency of screen illumination. In the unlikely event of the film remaining stationary in the "gate" for a longer period of time than usual, which might lead to ignition, guillotines automatically come into operation isolating the short length of the film between the two spool boxes, which are sealed automatically. The projector motor and arc-lamp supplies are also automatically isolated immediately the guillotine fuse fires. Self-contained integral gearless eddy current drive and eddy current damping give ripple-free film motion, while a new optical system provides for future picture advances such as multi-track recording.

The 90 W amplifiers provide a more than ample reserve of power, since normally only 15-20 W is required, with in extreme cases up to 40-45 W. Special runners enable the amplifiers to be drawn forward and turned over for inspection and testing while actually running and plug and socket connections facilitate complete removal and replacement. Other components are similarly accessible for inspection, maintenance and replacement.

An additional 90 W amplifier can be used as a standby to the main amplifier and also used for public address work, the loudspeakers for which are incorporated in the ante-proscenium walls behind grilles. A monitor loudspeaker in each of the stands is operated from a separately linked amplifier which also serves deaf-aid appliances attached to certain seats in the auditorium.

In addition to the two projectors there are installed in the projection room a Premier slide lantern and a Premier combined slide, spot and effects machine. The d.c. required for this apparatus is provided by two E.C.C. "Ecwelite" 346/440 V 3 phase 50 cycle 65/75 A self-ballasting mercury arc rectifier equipments in the rectifier room adjoining. Normally one of these rectifiers serves the "Supa" apparatus and the other the two spot and slide units, but provision is made to run



In the well-laid-out switchroom every main circuit is isolated, employing "Simplex" switch or fuse gear

the "Supa" apparatus from the second rectifier if the first fails.

Also installed in the rectifier room is a B.T.H. "Thyrect" mercury arc rectifier for the 110 V emergency lighting. Incorporating thyratron control, this apparatus is completely automatic in action and the charging rate does not have to be manually adjusted when an increased load is placed on the battery. The rectifier maintains the emergency lighting so long as the mains supply is available and changes over automatically to the batteries should the mains supply fail. The batteries comprise forty-eight 80 Ah "Ediswan" cells.

A fully automatic plenum heating and ventilating system is provided for the theatre, supplemented by radiators in the auditorium, foyer, staff rooms and offices. Thermostatically controlled gas-fired boilers are used for heating the necessary water which is circulated round the building by means of a pump driven by a 1 h.p. 1,420 r.p.m. Newman motor.

The air-washing and heating plant is situated on the roof. Normally the air is drawn in from outside the building, washed, warmed and blown by a 6ft fan (driven by an 8 h.p. 600-920 r.p.m. variable-speed Bull motor with Airedale speed regulator) via ducts discharging through troughs at the back of the balcony and stalls: two 2ft 6in extract fans (½ h.p. motors supplied by Webster), one on each side of the building, remove the vitiated air through the grills in the roof. For use in foggy weather a re-entrant system with a fan driven by a 1½ h.p. Bull motor can be brought into service, taking the air from the auditorium, washing and (if necessary) warming it and returning it to the theatre.

The plenum system has a capacity of 1,300,000 cu ft of air an hour and provides three complete air changes an hour. It is possible to raise the temperature 5 deg F in 20 minutes. The temperature is regulated by dual thermostatic control in stalls and circle. This thermostat controls motorized valves on the hot water flow, these being set to give a drop in air temperature of 5 to 10 deg F, which is sufficient to prevent undue rise in inside temperature without causing draughts.

In a well-laid-out switchroom in the basement every main circuit is isolated, employing Simplex metal-clad switch and fuse gear. Special gear is used for the neon installation.

The electrical installation was carried out by the Etna Lighting & Heating Co., Ltd., the heating and ventilation being undertaken by the Brightside Foundry & Engineering Co., Ltd. The electrical stage-curtain gear and tracks and dual-control push-buttons for operating them were installed by W. J. Furse & Co., Ltd., Lighting fittings, including float and batten units were supplied by F. H. Pride, Ltd.; Ionlite, Ltd., being responsible for the neon sign and cold-cathode lighting. Sound Equipment, Ltd., supplied the sound and projection equipment and battery charging rectifier. Other electrical equipment was supplied by K.F.M. Works (signs), Smiths English Clocks, Ltd. (clocks), and the British Vacuum & Engineering Co., Ltd. (central vacuum-cleaning plant).

We thank Mr. S. B. Swingler, joint engineering controller of C.M.A., Ltd., and Mr. E. P. Rouse, chief projectionist of the cinema, for their assistance.

Road Vehicle Lighting

THE Minister of Transport has made new Road Vehicle Lighting Regulations which consolidate, with some amendments, the Regulations made in 1936 and subsequent Amendment Regulations.

The principal amendments are the abolition of the requirement that obligatory front lamps shall be of the same power; a new requirement that the centres of front lamps, the power of which exceeds 7 W, on motor vehicles first registered on and after 1st January, 1952, shall not be more than 3ft 6in, or less than 2ft 2in from the ground, except in the case of lamps used only in fog or when snow is falling; an increase from 3ft 3in to 3ft 6in in the maximum height for swivelling front lamps; and provision to enable searchlights and other special lamps on stationary vehicles to be used for emergency repairs to sewers and to gas, water and electrical apparatus. Copies are obtainable from H.M. Stationery Office.

Passenger-operated Doors.—Last week, passenger-opening of train doors was introduced by London Transport at Northern Line stations from Golders Green and East Finchley northwards. The system is designed to add to the comfort of passengers by avoiding unnecessary opening of doors at surface stations.

Impedance Bonds

Their Use In Railway Track Circuits

By H. C. TOWERS,* M.I.E.E., M.I.R.S.E.

THE railway track signalling circuit is an arrangement whereby the running rails form part of an electrical circuit. The individual circuits are divided one from the other by insulating the rail joints, and their length may vary from a few hundred feet to several miles. Special problems arise, however, when such systems have to be installed on electrified lines where current collection is overhead or third rail, since the running rails are used as the return conductor for traction current and continuity is essential.

The problem can be solved by using circuits in which only one rail is divided by insulating joints while the other is continuous for the traction current. This is suitable for short track circuits, locking points, etc., but because only one rail is available for traction current, the length over which the circuit can be operated is limited by the voltage drop due to the traction current which inclines to saturate the track relay and feed transformer.

An alternative arrangement is the use of double rail track circuits in conjunction with a device at the divisions between tracks, which is known as an impedance bond (Fig. 1). Both running rails are divided by insulated joints, but a path for the return traction current is provided by the impedance bond.

This comprises a large laminated core around which is wound several turns of heavy copper bar. The winding is tapped at the centre and, two of these bonds being placed at an insulated rail joint, the outside of the winding is connected to the running rails while the centre points are joined together.

Referring to Fig. 2, the return traction current flows along rail A, through one

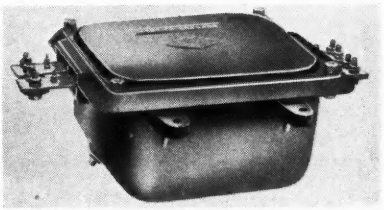


Fig. 1.—A typical railway impedance bond

half of the winding of bond 1 to one half of the winding of bond 2 and thence to rail B. Current flowing in rail C passes through the other half of the winding of bond 1, to bond 2, and then to rail D. The windings are connected in opposition so that the magnetic flux produced in the cores of bonds 1 and 2 by the current passing from rail A to rail B is neutralized by the current passing from rail C to rail D. The alternating current used for the signalling circuits endeavours to pass from rail A to rail C and rail B to rail D, but as this has to traverse the whole of the bond winding, considerable impedance is induced. A very small a.c. magnetizing current is necessary to produce the flux required to maintain the counter e.m.f. sufficient to prevent shorting of the track circuit.

The bond core is of high permeability

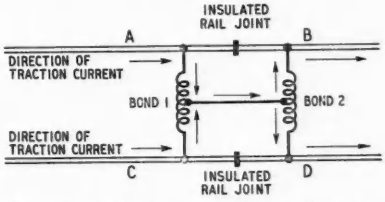


Fig. 2.—Basic circuit diagram showing method of operation of an impedance bond

* *Bombay, Baroda and Central India Railway.*

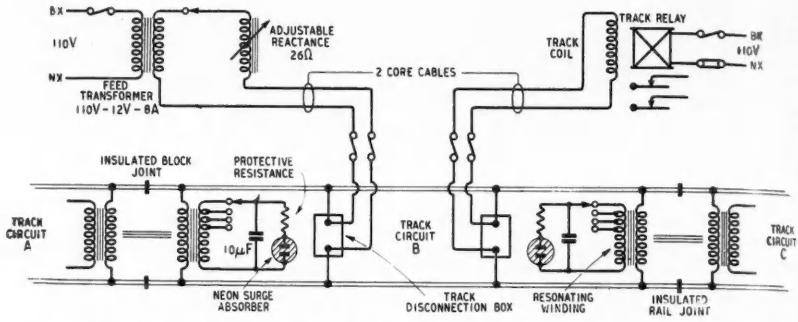


Fig. 3.—Diagram of track circuit layout incorporating resonated impedance bonds

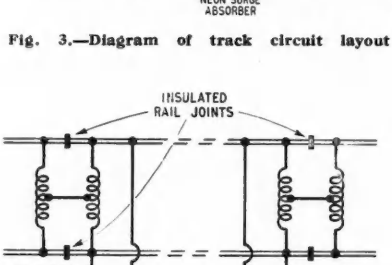
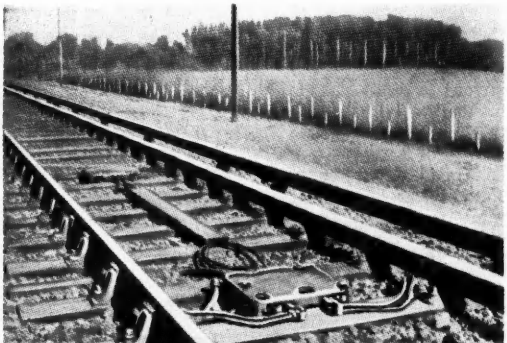


Fig. 4.—Arrangement of auto bond connections

material, usually of shell construction, while the copper winding is of sufficient cross section to pass the normal full-load traction current flowing in each rail. The bond is housed in a cast iron box, filled with petrolatum or other suitable material to protect the winding, and arranged to be placed in the four-foot way, between rails. Lugs are provided to permit the case being bolted to straps or direct to the sleepers. The cable connections between rails and bonds are usually bolted to connection straps which are taken from the internal windings through bushings in the case. In another type of construction the cable connections are taken through and terminated inside. The connections for the track circuit relay or wires from the track feed transformer are terminated either on the bond connecting straps themselves or on special terminals provided in the bonds.

Fig. 5.—Example of impedance bond layout on British Railways (Southern Region)



In some countries, where heavy rain is experienced at certain periods of the year, it is considered undesirable to remove the bond cover more than is absolutely necessary. On the Bombay, Baroda and Central India Railway, special terminals are provided for the track circuit connections, housed in a small cast iron box and fixed between the rails, so that testing can be carried out without interfering with the bond.

Because of faulty bonding across rail joints, curves and exceptional wear on rails,

there is a tendency for the traction current return to become "unbalanced." In other words, more current flows through one rail than the other. This affects the impedance bond, in that more current flows through one half than the other, resulting in saturation of the iron core, with a corresponding loss of impedance. This trouble is overcome by providing an adjustable air gap in the core to increase the reluctance. It is also necessary, however, to adjust the track feed voltage because of the increased a.c. magnetizing current required by the bond.

The maximum efficient length of track circuits employing impedance bonds is limited due to the shunting effect of the bonds across the track relays and feed transformers. The latter must also be of larger capacity than those required for circuits without bonds.

Several firms manufacture a resonated bond (see Fig. 3) which incorporates a capacitive circuit. The required power is supplied by the resonant current from the condenser, and the amount of current required to be supplied to the track on account of losses is correspondingly reduced.

Another attempt to operate track circuits with impedance bonds over greater lengths has been made with an auto bond, which is now used in various parts of the world. Track circuits so equipped are operating over 15,000ft with good train shunts and very small power consumption.

In general appearance and construction the auto bond is similar to the ordinary impedance bond but in addition to the winding through which the traction current flows, it has an auxiliary winding, one end of which is connected to one end of the traction winding (see Fig. 4). In this way it functions as an impedance bond and also as a step-down auto-transformer for feeding the track circuit, or as a step-up auto-transformer for operating the track relay.

Impedance bonds are usually made in two sizes, 500 A and 1,000 A per rail. The d.c. resistance of all the turns in series is about 0.0008 Ω in the case of 500 A models and 0.0004 Ω for 1,000 A models.

The device is an expensive piece of apparatus and the cost of a track circuit with two bonds is nearly four times as much as one operating on a.c. without bonds. The use of impedance bonds on railways employing the overhead system of current collection is inescapable, but with the rail contact system they may be replaced by a negative conductor rail. The latter arrangement is used as standard by the London Transport railways, but on the Southern Region of the British Railways many hundreds of miles of main line electrification is in operation using an earth return and impedance bonds.

AUSTRALIAN NEWS

From a Correspondent

A NEW power station at Howard, north of Maryborough, Queensland, is expected to be in commission by September next. This station will eventually provide supplies for an area of some 16,000 square miles. It is the most advanced power station in the State's £15 million plan for electrical development. The plan provides for new stations at Rockhampton and Townsville and completion of surveys into the Tully Falls hydro-electric scheme for the Cairns area.

In Perth both supply authorities and public are prepared for serious cuts in electricity during the coming winter months. Shortages of equipment are likely to delay the opening of the new power house at South Fremantle.

The electricity authorities of Brisbane are making every effort to prevent a power shortage in 1952 or 1953. The City Electric Light Co., Ltd., is building a new power house adjoining its present one at Doboy (Bulimba) and the City Council is preparing a site for a new power house at Tennyson.

The South Australian Public Works Committee has begun to take evidence concerning the biggest project ever referred to it—a £3,800,000 plan for the electrification of Adelaide's suburban railways. The chairman of the committee (Mr. Christian) says that it will probably be several months before inquiries are completed and the committee will visit other States to study the operation and costs of electric railways there.

The Minister for Supply and Development (Mr. Casey) said recently that the capacity

for manufacturing the whole range of electrical domestic appliances in Australia, with the exception of refrigerators, is well above the present demand, but a survey made by the Division of Industrial Development shows that the average Australian husband has to work 6½ weeks to buy his wife a washing machine whereas the American husband can buy one for less than 2½ working weeks. As a result, the ultimate Australian capacity for such machines is assessed at 25 per cent of homes, or about 400,000 machines. At present only 80,000 homes have these machines and the demand is concentrated around those costing £60 to £70 "although there is some demand for a lower-priced machine costing £47 which is attached to existing wash troughs."

The Division's comments on other labour-saving electrical devices are: Dish-washers: the appliance does not appear to have reached the degree of efficiency of the clothes washer. . . . There is a limited demand. Food mixers: the maximum Australian demand is put at 8 per cent of homes. The average cost is £20 and there is a waiting list of about 5,000 concentrated on one popular make. Floor polishers: the demand is strongest in Queensland, Western Australia and northern New South Wales, where linoleum and polished boards are popular. Ironers: the flat type is more popular because of its price (£27) although the rotary type (£38) is generally regarded as more efficient. Australian potential is assessed at 4 per cent of homes. Irons: there is one in practically every connected home, but new automatic heat control and lightweight irons may speed the obsolescence of standard types. Coffee percolators: the demand is limited because of the national tea-drinking habit.

The Premier of Victoria (Mr. Hollway) recently opened the new £600,000 Electrolux Works at South Yarra. It is stated that every mechanical process in the making of the company's products is represented in this new factory.

The Western Australian Government Statistician reports that during the twelve months ended 30th June, 1949, imports into that State included: Covered electric wire and cable valued at £381,593 (£204,645 from overseas); filament lamps, £79,886 (£14,663); wireless equipment, £373,348 (£20,356); telephone and telegraph instruments and appliances, £252,947 (£190,221); electric heating and cooking appliances, £102,973 (£25,238); dynamo - electric machinery, £457,148 (£320,891); and other electrical equipment and appliances, £578,033 (£148,861).

Development in Ireland

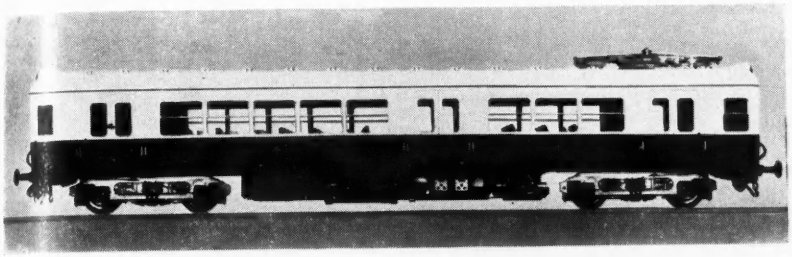
Speeches at Portarlington Ceremony

SPEAKING at the opening of the turf-fired power station at Portarlington, Ireland, an illustrated description of which was published in our last issue, Mr. R. F. Browne, chairman of the Electricity Supply Board, stated that the Board's programme was based on the probability that the demand would be doubled within the next six or seven years.

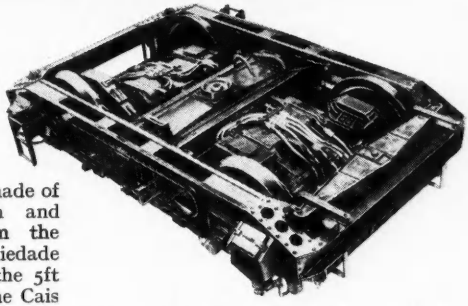
During the past year, he said, they had completed two other power stations—one at the North Wall, Dublin, which was ready before the time estimated, and the other at Leixlip. Eight new generating stations had been planned, of which five were now under construction. Work was progressing very satisfactorily on the Upper and Lower Erne schemes. They hoped soon to complete the second turf station at Allenwood, which would be larger than the one at Portarlington. The E.S.B. had extended rural electrification to a little more than one-tenth of the country. There was considerable capital investment in the work that they were doing at present; it could be "measured at £5,000,000 a year."

Mr. Morrissey, Minister for Industry and Commerce, was handed a gold key to open the station and later set the machinery in motion. During the luncheon the Minister was presented with an electric clock by the chairman of the E.S.B. Mr. Morrissey spoke of the origin and development of peat-produced power, expressing pleasure that Mr. L. J. Kettle had lived to see the realization of his dream. Thirty years ago the late Sir John Purser Griffith conceived the idea of producing electricity from turf, and had constructed and financed at Tarraun Bog, near Ferbane, turf cutting machines which were still driven by electricity from turf. As a result of the present scheme the impassable marsh of Clonsast had been transformed into a busy industrial centre giving employment to 800 men at the peak of the season. Despite the tremendous expansion, production of electricity in Ireland per head of the population was still substantially lower than in other Western European countries, and he was satisfied that the increase in demand in Ireland would be maintained and even accelerated.

Portuguese Electric Railway



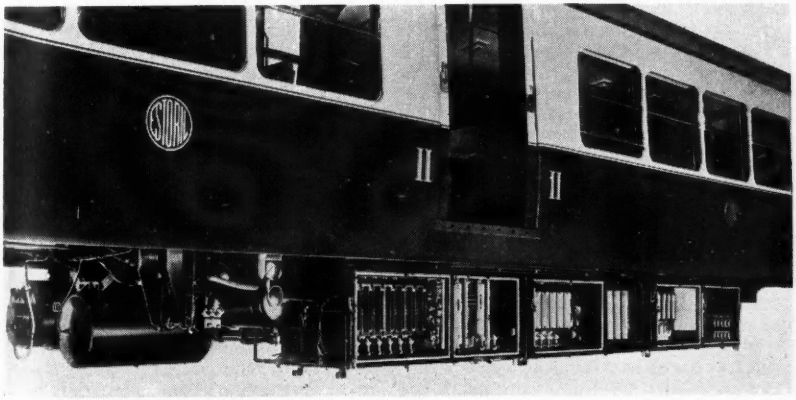
New Rolling Stock for 1,500V D.C. System



Motor bogie equipped with two 170 h.p. 1,100/1,600V axle-hung traction motors

DELIVERIES are now being made of the electric motor coach and trailer stock ordered from the General Electric Co., Ltd., by Sociedade Estoril, Portugal, for service on the 5ft 6in gauge railway running from the Cais do Sodre Station in Lisbon to Cascais (15¾ miles). This line follows the northern shore of the Tagus estuary and serves en route the resort of Estoril. It is electrified on the overhead system at 1,500 V d.c., and the electrical equip-

Below: The main and auxiliary equipment cases are mounted on the coach underframe



The second class section of each coach accommodates 40 passengers

ment of the rolling stock is designed for operation over a voltage range from 1,600 maximum to 1,100 minimum. Train services consist of all-stations, semi-fast and fast trains, the semi-fasts running non-stop from Lisbon to Pedroucas (4½ miles) or Cruz Quebrada (6 miles), and the fast trains non-stop to S. Joao de Estoril (14 miles).

The new rolling stock comprises two first and second class motor coaches, two second class trailers, and three third class trailers of welded all-steel construction, with mechanical parts and bodies built by Cravens Railway Carriage & Wagon Co., Ltd., Sheffield, as sub-contractors to the G.E.C. Accommodation is provided in each motor coach for 20 first class and 40 second class passengers. All control equipment cases, the battery case and the auxiliary machines are slung on the underframe and as only a small section at one side of each end vestibule is occupied by the driving compartments there is adequate passenger space.

Each motor coach is carried on two two-axle bogies, with two nose-suspended, axle-hung motors in each bogie. Maximum speed is 46 m.p.h. Current is collected by a pantograph which is pneumatically raised or lowered by momentary operation of an "up" or "down" push-button in the driving compartment. Apart from the main isolating switch alongside the pantograph on the roof, and the driver's controls, all the equipment is mounted on the underframe.

The main and auxiliary control equipment is in three semi-permanently mounted cases, two of which contain the control gear for the main motors, and the third the control gear for the auxiliary machines and battery. Also on the underframe are a 1,500 / 110 V d.c. motor-generator for the control circuits, lighting and battery charging; a 110 V motor-driven compressor to provide compressed air for pantograph operation and the electro-pneumatic contactors; and a 1,500 V motor-driven exhauster for vacuum braking. The remainder of the underframe-mounted electrical equipment comprises the control resistances and battery.

The two self-ventilated motors in each bogie are connected permanently in series, control being effected by series or parallel connection of the pairs. At 750 V the full field one-hour rating is 165 h.p. and the continuous rating 130 h.p. With weak field the corresponding ratings are 170 h.p. and 140 h.p.

The motors drive the axles through single-reduction straight spur gearing with a ratio of 17/84. The armatures are mounted on grease-lubricated roller bearings, while sleeve type bearings are used for the axle suspensions.

The 8 kW motor-generator set for the l.v. supply is totally enclosed with motor and generator armatures on a common shaft, the two-pole motor runs direct from the 1,500 V supply.

The battery supplying the lighting circuits floats across the l.v. generator and cannot be used unless the generator is running, since it is connected to the lighting circuits through double-pole fuses and a contactor which is energized by the generator output. This prevents excessive demands on the battery.

Kelvin Lecture

Phase-Boundary Potentials

THE forty-first annual Kelvin Lecture was delivered by Professor E. K. Rideal at the Institution of Electrical Engineers last week. He said that the scientific interest and achievements of Lord Kelvin were so diverse and covered so many branches of science that a Kelvin lecturer could be chosen from workers in many diverse branches of physics and engineering, both mechanical and electrical. Nevertheless it might be thought that there could be but little connection between his work and colloid science but, as was now known, in that subject the properties of interfaces were all-important and in that connection Lord Kelvin made several important contributions, each of which had had far reaching implications in that science.

Surface Tension Concepts

The surface tensions of liquids usually fell as the temperature was raised, and Lord Kelvin showed that there was in consequence an absorption of heat when the surface of a liquid was extended. While that fact could be deduced in its qualitative aspects from the principle of mobile equilibrium of Le Chatelier and Brauns, it was the quantitative relationship which was so important.

There were three important implications from the equation deduced by Lord Kelvin. First, it showed that when the surface energy of a liquid was determined a free energy analogous to the molar free energy of a compressed gas, or the molar osmotic energy of a solution was measured. That concept had proved to be of inestimable value in the development of the idea of a surface phase. Secondly, it permitted, from measurements of the free surface energy at various temperatures, the evaluation of the total surface energy and hence the total molecular surface energy. The molecular surface energies of substances at appropriate fractions of their corresponding critical states could thus be compared, so the change in energy which a molecule underwent in passing from the bulk liquid phase through the surface phase into the vapour could be determined. Lastly, from experimental measurements of the free surface energy it was possible to determine the entropy changes associated with the transfer of a molecule from a bulk to a surface phase.

Another important contribution of Lord Kelvin to the study of surface phases was his well-known relationship between the curvature of a surface and change in the vapour pressure caused by it. Qualitatively, the growth of large drops of liquids at the expense of small ones was a well-known phenomenon, but in its quantitative aspects the volume of exact experimental work to test the equation was remarkably small. In spite of that, it was employed in all manner of circumstances and far reaching conclusions derived from its application.

Wavelength Measurement Method

Before leaving the subject of surface tension, Prof. Rideal said it was interesting to recollect that Lord Kelvin in 1871 showed that the velocity of a wave moving over a horizontal layer of liquid, or at the interface between two liquids, was dependent on the wave-length of the ripple, on gravity and on the surface tension of the liquid. That method of determining surface tension had been used from time to time, but, recollecting that the surface tension was proportional to the cube of the wave-length until recently, the measurements of the wavelength were not of sufficient accuracy to obtain satisfactory values for surface tensions.

Calling attention to another phase of Lord Kelvin's activities, Prof. Rideal recalled how Kelvin described his method of using a quadrant electrometer and a bridge method somewhat analogous to that already utilized by Wheatstone to examine and prove the existence of a Volta potential difference between different metals. The electric potential

throughout the body of a homogeneous conducting phase was constant, but since an electromotive force could be obtained from the terminals of a cell consisting entirely of homogeneous phases and their interfaces, it proved that in general there existed differences of potential across the latter.

The existence of a difference of potential at metal/metal interfaces was first implicitly recognized by Volta in 1808, but supporters of the chemical theory maintained that the Volta contact potential was itself due to chemical action. It was Kelvin who stoutly maintained the concept of the reality of the Volta potential. Utilizing his quadrant electrometer he showed that there was indeed a potential difference between dissimilar metals when they were placed in the alternate quadrants and that that potential difference could be modified by oxide layers and other surface contaminants.

The measurement of phase boundary potentials at air liquid interfaces was now widely employed for the determination of molecular structure, phase changes and rates of chemical action. "We see, therefore," concluded Prof. Rideal, "that Kelvin laid the foundation stone of many interesting and important phases of colloid science."

Film Studio Lighting

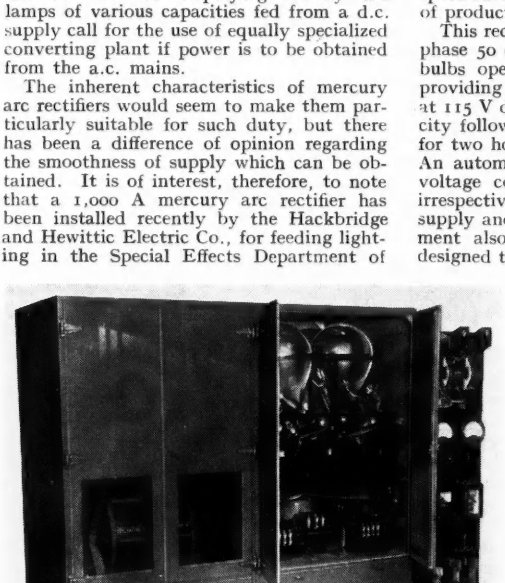
Mercury Arc Rectifier Installation

THE specialized lighting requirements in film studios employing mainly arc lamps of various capacities fed from a d.c. supply call for the use of equally specialized converting plant if power is to be obtained from the a.c. mains.

The inherent characteristics of mercury arc rectifiers would seem to make them particularly suitable for such duty, but there has been a difference of opinion regarding the smoothness of supply which can be obtained. It is of interest, therefore, to note that a 1,000 A mercury arc rectifier has been installed recently by the Hackbridge and Hewittic Electric Co., for feeding lighting in the Special Effects Department of Technicolor, Ltd., in connection with specialized work where a very high standard of product is required.

This rectifier, which is fed from the three-phase 50 c/s mains, incorporates four glass bulbs operating as a six-phase bank and providing a continuous output of 1,000 A at 115 V d.c. two-wire. The overload capacity following a full load run is 25 per cent for two hours or 100 per cent momentarily. An automatic regulator maintains the d.c. voltage constant within ± 1.0 per cent, irrespective of variations in the incoming supply and the rectifier loading. The equipment also incorporates a smoothing unit designed to reduce the ripple in the rectifier output to less than ± 0.1 per cent. r.m.s.

The overall dimensions of the complete unit excluding the transformer are 4ft 6in by 9ft by 8ft 6in high. No special foundations are required, and as the overall weight is only in the neighbourhood of 2½ tons, the equipment can be accommodated almost anywhere without special construction.



1,000 A Hewittic mercury arc rectifier for the provision of d.c. supply for film studio lighting in the Special Effects Department of Technicolor, Ltd.

OVERSEAS ELECTRICAL TRADE

A New Export Record in March

THE March figures for exports of electrical apparatus and machinery are the highest ever recorded. At £11,816,984 they are £346,882 above the previous best total, recorded in January, 1949, and £966,958 above that for March last year. The results relating to electrical goods and apparatus are particularly encouraging in that they maintain the upward trend achieved in recent months, the total of £7,384,490 comparing with £7,115,039 in the corresponding month of last year.

Increased purchases from £1,609 to £103,630 by Argentina were a notable feature under the classification "telegraph and telephone cables and wires, other than submarine" in which Australia (£196,271 compared with £117,206) also contributed to the rise from £651,963 to £862,984. New Zealand doubled its purchases of other types of cables and wires (£131,548 instead of £65,497) while Sweden took £75,925 worth instead of £22,659: India's share fell from £354,047 to £173,701 and South Africa's from £224,705 to £36,301.

Orders from France valued at £110,266

TABLE I—ELECTRICAL EXPORTS

Class	March, 1950	March, 1949
	£	£
Telegraph and telephone cables and wires (submarine)	90,576	30,255
Ditto, not submarine ...	862,984	651,963
Wires and cables, cotton, silk or artificial silk insulated	48,015	100,849
Ditto, enamel, glass or asbestos insulated ...	69,928	105,951
Ditto, paper insulated ...	688,304	771,851
Ditto, rubber insulated ...	313,559	484,639
Ditto, other	95,524	90,344
Commercial radio apparatus	481,760	306,579
Domestic radio apparatus...	225,056	351,869
Telegraph, telephone and signalling apparatus ...	1,559,928	1,250,729
Radio loudspeakers ...	29,504	27,800
Sound reproducing apparatus, components and parts other than cinematograph apparatus ...	444,382	254,000
Other sound reproducing apparatus	87,433	59,950
Radio valves	188,006	185,215
Electric lighting carbons...	18,020	11,902
Lamps not exceeding 24 V.	37,353	37,918
Discharge lamps	29,964	24,360
Other lamps	60,875	75,522
Other lighting apparatus ...	322,792	462,021
Primary batteries	74,465	72,786
Parts other than carbons...	20,470	24,944
Accumulators for motor vehicles	157,334	164,461
Ditto traction	14,437	18,197
Ditto radio	3,367	1,569
Other portable accumulators	70,285	15,247
All other accumulators ...	69,228	36,922
Parts and accessories ...	45,780	90,483
Cooking appliances ...	111,623	146,924
Heating appliances ...	50,994	102,989
Parts and accessories for cooking and heating appliances	41,853	37,939
Flat irons	49,861	31,075
Commercial electrical instruments	107,018	109,440
House service meters ...	103,548	152,075
Time recorders and time switches	16,484	8,937
Other electrical instruments	90,938	82,357
Electro-medical apparatus (not X-ray)	38,471	48,265
X-ray apparatus, tubes and parts	64,748	63,490
Permanent magnets ...	23,984	11,998
Insulating cloth and tape...	84,371	69,118
Other insulating materials	88,137	86,261
Unclassified electrical goods and apparatus	403,131	455,845
TOTAL electrical goods and apparatus	7,384,490	7,115,039
Generators, up to 200 kW...	817,558	589,897
Ditto, over 200 kW ...	266,142	292,799
Ditto, parts	166,648	126,022
Motors, railway and tramway	41,430	23,938
Ditto, other, not over ½ h.p.	63,184	109,897
Ditto, over ½ h.p. but under 1 h.p.	28,512	59,941
Ditto, from 1 h.p. to 250 h.p.	450,590	554,219
Ditto, over 250 h.p. ...	20,395	87,490
Ditto, parts	92,664	62,161
Converting machinery ...	27,956	5,364
Transformers, including coils	669,422	464,725
Rectifiers for power house use	43,091	17,084
Motor starting and controlling gear	202,619	173,925
Switchgear and switchboards (not telegraph or telephone)	1,097,673	771,448
Other electrical machinery	35,095	32,908
TOTAL electrical machinery	4,022,979	3,371,818
Vacuum cleaners and parts	188,153	223,213
Other electrically operated portable appliances ...	105,990	74,538
Portable electric tools ...	115,372	65,628
GRAND TOTAL	11,816,984	10,850,236

were largely responsible for a rise from £306,579 to £481,760 in shipments of commercial radio apparatus, while to a virtual cessation of business with South Africa (£4,833 compared with £109,388) can be traced most of the decline in sales of domestic radio apparatus from £351,869 to £225,056.

TABLE II.—DISTRIBUTION OF ELECTRICAL GOODS AND APPARATUS

Destination	March, 1950	March, 1949
	£	£
Channel Islands	45,783	28,711
Malta and Gozo	56,7'8	24,337
Cyprus	11,933	10,490
British West Africa ...	193,006	125,519
Union of South Africa ...	453,864	962,697
Northern Rhodesia ...	45,563	23,083
Southern Rhodesia ...	166,649	150,040
British East Africa ...	115,538	104,019
Bahrein, Koweit, Qatar and Trucial Oman	56,087	56,027
India	638,645	873,572
Pakistan	199,415	130,674
Malaya	326,688	229,503
Ceylon	104,807	61,607
Hong Kong	135,747	198,944
Australia	1,048,157	824,886
New Zealand	478,291	336,156
Canada	120,956	59,542
British West Indies ...	122,969	103,579
Anglo-Egyptian Sudan ...	51,801	61,906
Other Commonwealth Countries	92,731	87,378
Irish Republic	297,422	216,939
Soviet Union	29,411	37,889
Finland	34,122	34,223
Sweden	185,657	255,671
Norway	173,301	119,591
Iceland	7,820	23,016
Denmark	91,498	88,388
Poland	23,343	105,453
Germany	12,556	10,397
Netherlands	192,679	138,526
Belgium	99,928	92,314
France	150,305	76,648
Switzerland	37,209	22,240
Portugal	66,720	158,076
Spain	10,746	42,704
Italy	47,912	12,914
Austria	27,341	22,602
Hungary	25,762	6,605
Czechoslovakia	25,984	70,482
Greece	108,606	27,885
Turkey	19,630	53,581
Indonesia*	20,677	31,300
Netherlands Antilles ...	6,939	9,247
Portuguese East Africa ...	13,241	7,528
Syria	19,375	48,736
Lebanon	40,297	69,500
Israel	28,142	23,987
Egypt	247,963	222,990
Arabia	11,975	27,183
Iraq	95,336	62,523
Iran	117,294	74,521
Burma	34,937	20,930
Thailand	26,246	7,771
China	135	18,156
United States of America...	19,700	28,209
Mexico	5,763	29,031
Colombia	20,123	9,184
Venezuela	59,270	63,699
Chile	22,409	14,343
Brazil	84,854	74,630
Uruguay	26,243	25,205
Argentine Republic ...	218,951	106,341
Other Foreign Countries ...	131,290	73,211
TOTAL	7,384,490	7,115,039

* Includes Netherlands New Guinea in 1949.

Principal contributors to the continued expansion of telegraph and telephone exports from £1,250,729 to £1,559,928 were Australia (increase from £271,874 to £470,196), New Zealand (from £89,663 to £152,301) and India (from £72,353 to £125,514). South Africa reduced its purchases of this class of equipment from £196,430 to £184,523 and was also responsible with Australia for most of the decline from £287,852 to £204,420 in exports of cooking and heating apparatus, these two countries taking respectively £9,085 and £46,702 worth of these goods compared with £55,105 and £80,357 in March, 1949.

With regard to exports of electrical goods and apparatus as a whole, Australia continues to hold first position among the most important buyers with £1,048,157 worth, followed by India (£638,645), New Zealand (£478,291), South Africa (£453,864), Malaya (£326,688) and the Irish Republic (£297,422). Canada almost doubled its purchases (£120,956 worth, as compared with £59,542), but sales to the United States fell from £28,209 to £19,700.

All types of generators were much in demand, Russia (£439,475) continuing to be the largest buyer. About £100,000 decline in the requirements for industrial type motors (1-250 h.p.) was recorded. Shipments of other types of electrical machinery rose from £1,465,454 to £2,075,856, South Africa (£392,439), India (£332,482) and Australia (£192,079) being the biggest buyers. It is interesting to note that while reducing its purchases in practically all other directions South Africa has in this instance favoured British equipment to the extent of almost doubling its demands.

Transformers for Gibraltar

IN connection with the scheme for changing the system of supply in Gibraltar from 110 V, 76 c/s to 240 V 50 c/s, we are informed by Partridge Transformers, Ltd., that it has received a contract from the Gibraltar City Council for 100 transformers to be used in the change-over scheme. These transformers have been specially designed to conform to the requirements of the chief engineer of the Gibraltar Electricity Authority and also the relevant B. S. Specification.

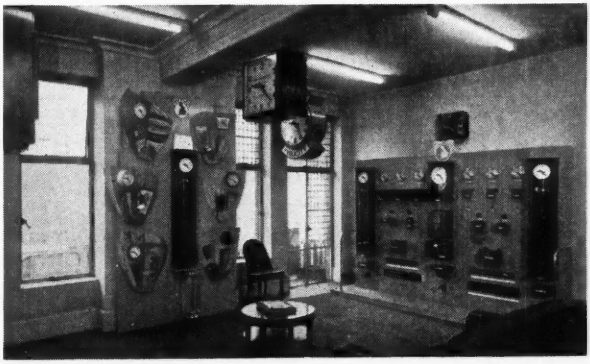
Commerce and Industry

F.B.I. and B.E.T.R.O.

Motors for Canada

AN engagement to render mutual aid has been agreed by the Federation of British Industries and the British Export Trade Research Organization (B.E.T.R.O.) which will eliminate a certain degree of overlapping of effort and function that has hitherto existed between the two organizations. It is also intended as a positive move in improving the constructive help available to British Exporters. B.E.T.R.O. will continue to be an entirely independent overseas research body and, under this new arrangement, will be financed solely by industry through its membership and turnover of work. It will receive a final payment from the Government in respect of the Board of Trade grant-in-aid, but thereafter no request for Government funds will be made.

Under the new arrangement the F.B.I. will promote the wider use of B.E.T.R.O. for market survey and research work among F.B.I. members, and B.E.T.R.O., by being given facilities to use the services of the F.B.I. overseas representatives, will be able to arrange schemes of overseas market research at an economical cost for its own members, for F.B.I. members, and for exporters generally. Export inquiries that are outside the field of market survey and research and which are part of the normal functions of the F.B.I., the Board of Trade and other organizations, will no longer be handled by B.E.T.R.O. Sir Norman Kipping, director-general of the F.B.I., left for Toronto and New York this week with the primary object of inspecting and developing the F.B.I. offices there. Mr. R. Falk, director-general of B.E.T.R.O., has also left for North America to see the B.E.T.R.O. offices. Advantage will be taken of these visits, with the help of local experts, to prepare the ground for the building up of an economical product-testing service available to British manufacturers. Arrangements will also be made for B.E.T.R.O. representatives to be accommodated in the F.B.I. offices.



Part of the new showrooms opened by English Clock Systems

Metal Price Increases

The Ministry of Supply announces that from 19th April the price of electrolytic copper has been increased from £153 to £162 per ton, delivered consumers' works. The Ministry's buying price for rough copper, in slabs of from two to three cwt, has also been raised from £120 to £126 per ton.

The price of good soft pig lead has been increased from £84 to £86 per ton delivered.

From 20th April the price of zinc has been increased by £4 per ton delivered to £95 10s. The zinc oxide manufacturers announce that from the same date the prices of zinc oxide in lots of not less than two tons, delivered buyers' premises, has been increased by £3 10s.

Time Equipment Showroom

English Clock Systems, Ltd., the industrial branch of Smiths English Clocks, Ltd., has opened new showrooms on the second floor at Speedometer House, 179-185, Great Portland Street, London, W.1, in which is displayed a complete range of

Miss L. M. Kaye receiving the shield from Mr. R. A. S. Thwaites at last week's finals of the E.D.A. Public Speaking Competition

timekeeping equipment. The equipment includes a working demonstration panel with two master clocks operating a number of slave circuits with dials, time recorder and bell signal control clock with audible signals and it clearly shows, in compact form, equipment that may be dispersed over many acres when in actual use. Also on show are many examples of outdoor advertising clocks, both double and single sided, which may be operated from a synchronous movement or from a master clock, and a wide range of indoor wall clocks for master clock operation; dials for turret installation; and a gravity escapement timepiece with automatic electric winding, striking and chiming gear.

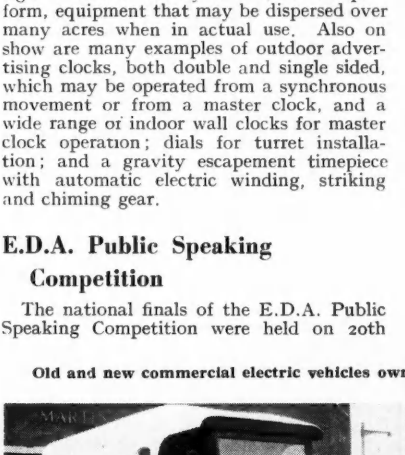
E.D.A. Public Speaking Competition

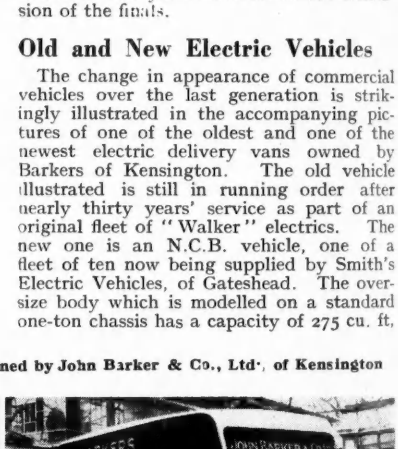
The national finals of the E.D.A. Public Speaking Competition were held on 20th April at the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. There were seven finalists in the women's section, and the winner of the Faraday Silver Challenge Shield was Miss Lorna Mary Kaye, a cookery demonstrator employed by the Yorkshire Electricity Board at Sheffield. There were three finalists in the men's section, the winner of the Silver Challenge Shield being Mr. D. Cameron, a sales representative attached to the Berwick-upon-Tweed service centre of the South East Scotland Electricity Board. The adjudicators were Miss V. Norvick, of the Electrical Association for Women, Mr. Frank Phillips of the B.B.C., and Mr. J. W. Thomas, Director of Training, Welfare and Safety, British Electricity Authority. Before the finals commenced, the shields were presented to the winners of last year's finals, Miss D. E. Wagstaff (Northmet Sub-Area, Eastern Electricity Board, Barnet), and to Mr. W. A. Crocker (manager, York Sub-Area, North Eastern Electricity Board), who received the Shield on behalf of last year's winner, Mr. J. Spencer, of Scarborough. The presentation was made by Mr. R. A. S. Thwaites, chairman of E.D.A. Council, who also presented the shields to this year's winners at the conclusion of the finals.

Old and New Electric Vehicles

The change in appearance of commercial vehicles over the last generation is strikingly illustrated in the accompanying pictures of one of the oldest and one of the newest electric delivery vans owned by Barkers of Kensington. The old vehicle illustrated is still in running order after nearly thirty years' service as part of an original fleet of "Walker" electrics. The new one is an N.C.B. vehicle, one of a fleet of ten now being supplied by Smith's Electric Vehicles, of Gateshead. The oversize body which is modelled on a standard one-ton chassis has a capacity of 275 cu. ft.

Old and new commercial electric vehicles owned by John Barker & Co., Ltd., of Kensington





including the "Luton" compartment immediately above the cab. The rear is fitted with roller shutters and a specially designed sliding type rear platform step.

Materials Handling Conference

A one-day conference on materials handling will be held in Bristol by the Institution of Production Engineers (Western Section). It will take place at the Victoria Rooms on 13th May, and the lectures and films comprising the programme have been chosen to give thorough coverage of many of the problems arising in handling materials efficiently with the maximum of economy. Photographs and working models of mechanical handling equipment, including Strachan & Henshaw automatic skip-hoists, rotary wagon-tipplers, telphers and special cranes; Lansing Bagnall industrial electric trucks incorporating the Lansing Bagnall traction circuit; Stothert & Pitt cranes, and Douglas high- and low-loading and high-lift industrial trucks, will comprise a small exhibition to be held in the conference room. The conference will be opened by the Section president, Mr. R. S. Brown and introduced by Mr. W. C. Puckey, national vice-chairman of the Council of I.P.E. Applications for tickets should be made to Mr. A. Eustace, 19, Ferndale Road, Northville, Bristol, 7. The conference will be preceded by a reception on 12th May at the Bristol Aeroplane Co., where members will be shown the Brabazon aircraft and hangar.

Electrical Commercial Travellers

The president of the Electrical Trades' Commercial Travellers Association, Mr. N. V. Everton, is making an appeal for new members so as to pass the 1,000 mark during this, the silver jubilee year of the Association and before his year of presidency ends. He points out that the Association has not increased its annual subscription since it was started twenty-five years ago, and that it has at the same time materially increased its grants to the charitable organizations it supports.

Membership of the Association is open to any person over the age of twenty-one years employed as a representative by an electrical manufacturer or recognized wholesale electrical firm and employed in this capacity for not less than six months in each year. It also includes principals travelling in their own interests. The main objects of the Association are: To provide a benevolent fund for the benefit of members and to render assistance to them in time of need; to assist the Royal Commercial Travellers' Schools, the E.I.B.A. and such other institutions as may be approved by the Association; to draw the fraternity together for social intercourse and to enable them to combine in united action on all questions affecting the welfare and advancement of the commercial traveller; and to provide an employment section to assist members in securing appointments. Full particulars may be had on application to the hon. secretary, Mr. A. J. Clark, 14, Denmark Road, Carshalton, Surrey.

Sales Conference

The Simplex Electric Co., Ltd., held its annual sales conference at Ashorne Hill, nr. Leamington Spa, Warwickshire, on 14th, 15th and 16th April. The conference, which was attended by all the company's branch managers and sales representatives, production, development and head office executives, was addressed by Mr. A. G. E. Briggs (managing director), Mr. C. Lacy Hulbert (technical director), Mr. A. G. Jones (works director) and other executives of the company. Mr. E. G. Plucknett (commercial director) presided throughout the conference.

E.T.U. Journal

The April issue of the official monthly organ of the Electrical Trades Union appears in a much improved form. Its title has been changed from *Electrical Trades Journal* to *Electron*, colour is used for the cover, and the type size has been increased. There is also a much better layout, although the use of heavy type as emphasis is perhaps overdone.

Brook Motors Sales Aid

An attractive showcard for their "Cub" fractional h.p. motors has been produced by Brook Motors, Ltd. This is silk-screened in five colours, and is quickly and easily set up for display on the electrical dealer's

A new five-colour Brook Motors showcard

counter or in the window. Cards may be obtained from the company's Publicity Department, Empress Works, Huddersfield, on request.

Traction Motors for Canada

From the Toronto Transport Commission, Canada, Crompton Parkinson, Ltd., have recently received an order for traction motors which is of particular interest because the motors have to be mechanically and electrically interchangeable with the latest type of American motor fitted to the P.C.C. tramcars. All external fittings and significant dimensions will be the same as those of the American machines and certain renewable parts, such as brushes, will be identical so as to avoid any departure from the established system of standardized replacement and maintenance.

Although the motors will be completely interchangeable, the general design and in particular the internal dimensions, conform to standard practice developed as the result of many years' experience with traction motors. The method of construction allows an armature of a larger diameter to be fitted into a frame of the same diameter as the American machine. Also the Crompton Parkinson motor has its field system, armature winding and commutator bars, proportioned to give a performance superior to the American P.C.C. motors, used in Toronto, in respect of stability during rheostatic braking at high speeds.

Without the shaft brake fitted, a motor weighs about 700 lb, has a one-hour rating of 55 h.p., 156 A at 300 V, and a continuous rating of 41 h.p. 127 A at 300 V. It is force-ventilated by a combination motor-generator/blower set. Anchorages are provided to permit the application of the Clark type of armature shaft brake.

Manchester Building Trades Exhibition

Electrical exhibits in the Manchester Building Trades Exhibition which opened in the City Hall, on 18th April, are not so numerous as it was expected they would be. Consumers' supply control units are featured by Mantel Metalworkers, Ltd., London, S.E.15. Two types of unit are constructed for houses and flats, (1) flush pattern, (2) semi-flush pattern. The industrial exhibits of this firm include "Zedlok" cable trunking which is an alternative to multiple conduit runs and gives the flexibility required for electrical installations in factories. Fan engineering equipment and air heaters are the specialities of Keith Blackman, Ltd. The unit heaters are designed for use with electricity, gas, hot water or steam as the heating medium. The North Western Electricity Board has on view an animated model of an electric cooker to display its advantages mechanically. The lagging of an electrically heated boiler is shown, also a standard house service unit. Photographs illustrate the application of electricity to housing estates. Associated Fire Alarms, Ltd., have a range of fire bells, alarm indicators, etc., also burglar alarm devices.

In the exhibition, which comprises more than 100 stands, there are many electrically operated woodworking and other machines shown in motion. The Lord Mayor of Manchester (Ald. R. Moss. J.P.) presided at the opening ceremony which was performed by Mr. W. D. Marshall, regional director of Ministry of Works.

Trade Announcements

New premises have been acquired by **Dexion, Ltd.,** at Triumph House, 189, Regent Street, London, W.1 (tel.: Regent 4841-5).

Ekco-Ensign Electric, Ltd., announces the appointment of two new representatives covering the Lancashire and Yorkshire areas. Mr. R. Seagrave, of "Wheatroyde," 14, Doctor Lane, Mirfield, Yorks, will operate from Leeds and undertake specific duties in Yorkshire while Lancashire will be handled by Mr. W. E. Garratt of 136, Park Road, Timperley, Cheshire, operating from Manchester in a similar capacity. Both representatives will be based on the company's office, at Kent Street Lamp Works, Preston.

Victor H. Iddon, Ltd., Wythenshawe, Manchester, have recently appointed Mr. V. R. Fry as their representative for "Nettle" bakelite electrical accessories and inspection handlamps in the London area, and all districts covered by the Southern, South Eastern and Eastern Electricity Areas.

Ship-Shore Communication

Mr. C. O. Stanley, chairman of the Pye Group of radio and television companies, announced last Tuesday a development in very-high-frequency radio telephony which will enable the captain, crew and passengers in a ship to put through ordinary telephone calls to shipping offices, business offices, or their homes from the point when the ship is approaching harbour. Until this, although ships have been able to use ordinary radio for communication when at sea, the congestion of the frequencies used has imposed a virtual ban on ships' radio in the vicinity of a harbour. A demonstration of the system was given in the Port of London to all those authorities who had

been following the development of the new service. Two systems were demonstrated. The equipment used was developed by Pye, Ltd., and the radio calls were made through the recently installed G.P.O. v.h.f. station at Shooters Hill.

Catalogues and Lists

Multicore Solders, Ltd., Mellier House, Albemarle Street, London, W.1.—Illustrated brochure dealing with multi-cored solders.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast, N. Ireland.—Technical brochure (SF372A) on "Aeroto" axial flow fans for industrial and marine requirements.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—Three catalogues of radio frequency cables, radio materials and cables for public address systems; also an illustrated folder on the construction of the 750ft television mast at Sutton Coldfield.

Advertisement Correction

Watford Instruments ask us to state that by mistake their advertisement, on page 56 of our issue of 21st April, referred to their stroboscope Model H.S.B. instead of the firm's other stroboscopes. There is a delay of four months in deliveries of this particular model, due to difficulties in obtaining the crystals required.

Telecommunications in Germany

WE have just received a copy of British Intelligence Objectives Sub-Committee (B.I.O.S.) Surveys Report No. 29 entitled "Telecommunications and Equipment in Germany during the period 1939-1945" (H.M. Stationery Office, price 1s 6d). This 55-page publication, which has been prepared by the General Post Office, embraces research and development, transmission, exchange equipment and manufacture, telegraphs, subscribers' apparatus, power and radio, the latter including broadcasting, wire broadcasting and television.

Direct comparisons are made between German and British principles and developments and a complete bibliography is given, occupying some 14 pages of references. It is evident that on the whole this country has not lagged behind Germany in any field of the telecommunications industry.

At the beginning of the war the Germans were well advanced in materials research, but they displayed less initiative than the allies during the war in developing the telecommunications system. This perhaps was to be expected as the industry was working under the worst possible conditions and the man-power available was required more to maintain an existing system than to develop a new one. The difference of the relationship of the Reichpost and the British Post Office with their manufacturing industries had also to be allowed for.

On the telephone side, for example, there was close collaboration between the Reichpost and Siemens & Halske with their establishments in Berlin and when the Berlin factories were lost there was no unit in Germany comparable in size with even the smallest of the principal British manufacturers.

The research section of the survey instances one type of research which has not been of comparable importance in the United Kingdom. This relates to the German wartime work on contact materials for relays, etc., with the object of finding substitutes for platinum, indium and similar alloys. The substitute alloys which emerged usually contained a high proportion of gold and some of them were as good as, or even better than, the original materials. For example, gold with 5 per cent nickel was found to be an excellent substitute for platinum.

The trend of development in Germany has also been coloured by their different approach to economies. This is particularly noticed in automatic telephony, where the Germans have tended to the use of greater quantities of simple mechanisms while the British Post Office leans toward the use of fewer numbers of a more complicated mechanism.

The Technical Information and Documents Unit of the Board of Trade, which is responsible for the preparation of B.I.O.S. Reports, will be transferred to Lacon House, Theobalds Road, London, W.C.1, on 1st May.

INFORMATION DEPARTMENT

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Wratton" standard lamp fittings.

General inquiries from readers relating to sources of electrical good, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

SUPERVISING ELECTRICAL ENGINEERS

Annual Dinner and Reunion

MORE than 500 members of the Association of Supervising Electrical Engineers and their friends attended the annual dinner and reunion on 21st April. Mr. A. G. Ramsey, president of the Association, was in the chair. The toast of "The Electrical Industry" was proposed by Mr. J. R. Beard (past-president), who mentioned the presence of seven out of the eight living past-presidents and of Mr. A. Brammer, the general secretary, who had completed 28 years of service. Referring to overseas trading, he said that other countries had little idea of what people here had to put up with in order to promote export. Recently when in South Africa he had heard complaints about late deliveries of plant, but there they knew nothing at all of load shedding.

Industry's Growth

The electrical industry, the largest after agriculture and mining, was now exporting plant at the rate of £140 million per annum in value, which was one-third of its total production and six times as much as the pre-war figure. This compared with 8 per cent for the United States, though the British total was less. The chief of several fields of activity of the A.S.E.E. was in contracting and installation. Remuneration and status was only one side of its task, which included helping members in legal and patent matters, and organizing apprenticeship schemes, technical meetings, works visits and educational competitions. The Swann Diploma was recognized as a mark of practical skill and experience and technical knowledge, and Professor R. O. Kapp had devised an original scheme of examination. One result was that the Association was represented on many important committees of the industry.

Responding, Col. B. H. Leeson (director, B.E.A.M.A.) described electrically driven machine tools as the slaves of the workers, relieving them of hard manual labour and improving their status. In export electrical equipment was a good second to cotton and motor vehicles, which tied for first place. Much was owed to research and development work, but more to the men themselves and their expert supervision in the installation and maintenance of plant so that it should be available where and when it was wanted. For this training and upgrading were essential and none should fear to hand on information that would help somebody else.

Proposing "The Guests," the President said that nearly 300 lectures and papers were given each year at meetings of the Association. These covered the varied products of some 60,000 factories of any size with seven million employees. Among the eminent guests he named was Mr. J. M. Crowdy, the first chairman of the Association at its formation in 1914 and now its first honorary member. Mr. Ramsey concluded with a plea for consideration of the problem of engineers in their late twenties who because of war conditions had received only one side of their training—either functional without technical, or *vice versa*.

Boards and Contractors

Sir Henry Self (deputy chairman, B.E.A.), responding, referred to an apparently prevalent misunderstanding of the relations of the Electricity Boards with the contracting industry. Actually they had come to agreement as to what constituted a fair field and honourable rivalry. Some (A.S.E.E.) members were connected with industries which generated their own electricity. These private plants were helpful at the present time, but would later provide a challenge to the B.E.A. to prove the advantage of public supplies. The mere provision of stand-by, however, would not be profitable.

Every opportunity would be offered by the B.E.A. to members of the staffs to make good through training. He recommended the cultivation of varied outside interests so that workers could come to their duties refreshed and therefore with increased efficiency and vision.

Industry and the House

The Budget Debate

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

THE first Budget of the new Parliament, coming so soon after the General Election, could hardly have been very different from what it was. During the campaign the Labour Party had pledged itself to maintain expenditure at its present level. It had decried Conservative assertions that Government spending could, and ought to have been reduced. The country had voted for the spending to go on, and so, clearly, the taxes must continue too.

In his Budget speech, Sir Stafford Cripps held out no prospect of a reduction in expenditure by the State. Rather will it increase automatically year by year as the full costs of the social services become apparent. Higher rates of insurance benefit, a bigger permanent education programme, more generous pensions, all decided on in previous Parliaments, now swell the mounting total of unavoidable expenditure. As Sir Stafford said, "the services are expanding automatically so that the cost increases every year." But revenue is not.

Taxation and Profits

The large automatic increases in revenue are coming to an end. The progressive increase in industrial profits which has gone on for nine years ended in 1948, and there is no hope for more revenue from this source. Profits have been taxed more severely than salaries and wages. There is a shift away from the earning of large profits to the payment of more money in the form of personal incomes. In this might be detected a hint of increased income tax on earnings, but the fear did not materialize. At the end of the first two hours of his speech, the Chancellor had a different surprise in store.

Some Members of Parliament had been expecting an increase in the rate of petrol tax, but no one envisaged a rise of 9d a gallon. There was a dull gasp from all parts of the House as the Chancellor made his announcement. Protests have been quickly delivered since. Motoring organizations, road hauliers, the taxi men, transport undertakings have all added their objections to a tax increase which is felt by many to be designed to drive traffic from the roads to the railways.

The purchase tax decision will give satisfaction to no one. Last year the Chancellor, by an ingenious trick, prevented purchase tax from being discussed at all. This year he decided to restrict discussion to the various rates of tax, making it possible to discuss any article within the range without effecting any change in the tax on any particular article.

Electricity Wayleaves

A small matter to which Sir Stafford only briefly referred is a clarification in the taxation treatment of certain electricity wayleaves. According to the Budget Resolution "rent in respect of any easement enjoyed in the United Kingdom in connection with any electric, telegraphic or telephonic cable" shall be charged to tax under Schedule D. The Government will doubtless explain the reasons for this more fully in the Committee stage of the Finance Bill.

In the ensuing debate the doctrinal differences between the two parties came well to the fore. Sir Stafford Cripps could offer only the familiar Socialist recipe and ideal: democratic planning, the ironing out of extremes of wealth, and the avoidance of long-term unemployment. The Conservative spokesmen, on the other hand, could point to the alternative they would pursue.

Thus Mr. R. A. Butler, in the opening speech on the following day, said that Conservatives believed certain controls were essential—particularly control in the field of public expenditure: "But what picture do we get of the failure to use

that vital control over our economy? Expenditure at £3,375 million had been exceeded by £200 million over the 1948-49 period. What certainty was there that this year supplementary estimates would be kept in bounds? We had the highest taxation burden in the world—43.5 per cent of the national income was taken away." This crushing burden was stopping effort, checking a rise in productivity, and "making it impossible for those incentives to be granted which were so vital."

On the following day Mr. Oliver Lyttelton attacked the Economic Survey's assumptions and hopes. During this speech the President of the Board of Trade intervened with a reference to the Opposition's lack of specific proposals for reducing expenditure. Later, Mr. Churchill gave a clear undertaking that when able to present his party's design and policy to the nation, they would propose definite reductions in expenditure, coupled with remissions of taxation.

After the budget resolutions have been taken without debate on the Report stage, the House will defer further discussions of financial matters until after the publication of the Finance Bill, 1950, which gives specific legal form to the Budgetary proposals. The Committee and Report stages of this Bill provide the main opportunities for detailed discussion on specific taxes, and proposed changes, but this is still several weeks away.

PARLIAMENTARY NEWS

By Our Special Reporter

DURING the debate on the Budget proposals, Mr. Parnell, Labour member for West Leeds, expressed doubts whether the 33⅓ per cent purchase tax was justified over the whole range of commercial vehicles. But whatever case there was in regard to the petrol-driven vehicle surely there was a case for exemption in respect of the electric vehicle. This vehicle had been developed largely because of the lack of petrol, and between 1945 and 1948 the number increased from 7,250 to 15,750.

It might also be considered as a dollar saver, although it could not be exported because it was built for the British market. Also, the electric vehicle cost almost twice as much to buy as a petrol vehicle, and therefore the tax of 33⅓ per cent seemed excessively harsh. With this vehicle there was no noise, no smell, and it was safer than a petrol vehicle. All the best food distributors had adopted the electric vehicle because of its cleanliness.

Zambesi Scheme

Mr. John Grimston asked the Secretary of State for Commonwealth Relations when agreement was expected on the timing of the scheme to generate electricity on a large scale at the Kariba Gorge on the Zambesi.

Mr. Gordon-Walker said that the Governments of Southern and Northern Rhodesia appointed, in 1946, an Inter-Territorial Hydro-electric Power Commission whose duties included the establishment of the necessary facts to determine whether it would be possible to obtain hydro-electric power from the Zambesi River near the Kariba Gorge. A considerable amount of data had now been collected and was being submitted to a panel of consultants, who would report to the Commission on the practicability of a hydro-electric power scheme. This report was not expected for some months, and, thereafter, the Commission must present its own report and recommendations to the two Governments.

Television in Wales

Mr. Goronwy Roberts asked the Postmaster-General, what progress was being made in finding a suitable site for the television station to serve Wales.

Mr. Ness Edwards said that up to the present B.B.C. engineers had made tests at three sites in the Bristol Channel area. The results were now being analyzed, but it had not yet been decided which was the most suitable or whether further tests would be necessary.

Scottish Undertakings' Reserves

Lieutenant-Commander Clark Hutchinson asked the Minister of Fuel and Power if he was yet in a position to make a statement about the disposal of the reserve funds which belonged to former local authority electricity undertakings in South-East Scotland.

Mr. Noel-Baker replied in the negative. He said that representations on this matter were received on 15th March and were under consideration. It was a complex matter; it involved questions of law as well as questions of finance and he could not now say how soon a decision could be made.

Improved Rural Supplies

New 22 kV Supply Point

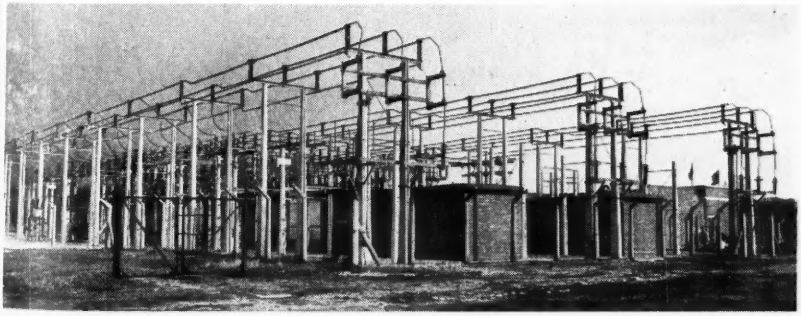
NORMAL development work on the rural distribution system in the Luton District was suspended during the war and because of this difficulties were frequently experienced in the outlying areas due to bad voltage regulation, obsolete switchgear, lack of space at the source of supply for any contemplated extensions and the inadequate provision for load growth. Following investigations in 1945 a programme was prepared for the development of supplies in these areas over a period of ten years.

It was decided that in the first stage the northern and south-western portions of the area should be supplied from Sundon and the eastern portion from the existing plant at St. Mary's Road generating station, Luton. This would then relieve the loading conditions at the latter point.

The original Sundon system, which was constructed between 1942 and 1944, operates at 33 kV on the secondary side and feeders at this voltage are laid to a primary substation at Chaul End, Luton, which supplies the western part of the borough of Luton. In addition, 33 kV feeders are laid between Sundon and Dunstable to supply the borough of Dunstable, the rest of the area being supplied at 6.6 kV and 22 kV from St. Mary's Road generating station in Luton.

Mr. C. T. Melling who performed the official opening ceremony in the control room

The first stage of the new work, which was initiated before the district became part of the Chilterns Sub-Area of the Eastern Electricity Board, has now been completed and on Monday last it was officially inaugurated by Mr. C. T. Melling, chairman of the Eastern Electricity Board. Others present at the ceremony included Councillor C. A. Sinfield, J.P., Mayor of Luton; Mr. P. G. Campling, manager of the Chilterns Sub-Area; and Mr. W. G. Tree, manager of the Luton District.



33 kV switchgear compo und at Sundon showing the new blockhouses

This new work establishes at Sundon a 22 kV supply point for the rural and outlying districts. Additional 33 kV switchhouses of the blockhouse type have been erected, the existing 33 kV outdoor busbars have been extended, two 15 MVA 33/22 kV transformers with on-load tap changing features have been installed, and a substation has been erected to house the 22 kV switchgear and auxiliaries. The existing 33 kV control room has also been extended to accommodate 22 kV control equipment.

All buildings are of brick and ferro-concrete construction with steel framework, reinforced concrete structures and supports being used for the outdoor busbar mounting.

The 33 kV switchhouses are arranged to accommodate two air-blast circuit breakers each rated at 1,000 MVA and a local control panel. Facilities for remote control are also provided from the control room. Modifications to the existing compressor plant have consequently been necessary and two new compressors and auxiliary equipment have been installed.

Existing outdoor busbars which have been extended are arranged in the form of a letter "E," the reserve bar being the central limb. They are of tubular copper, air spaced, mounted on concrete supports 26ft high, and connections to the 33 kV outgoing cables are made through outdoor air-break isolators forming part of the busbar assembly.

A ten-panel 22 kV duplicate-busbar, metal-clad switchboard of 250 MVA rating in the substation building comprises two transformer switches, one bus coupler, one bus section switch and six feeder equipments. The substation building is divided into four compartments, the communicating doors being self-closing and fireproof. The oil circuit breakers of this switchboard are equipped with automatic reclosing mechanism by which it is possible to arrange for a number of successive switch reclosures following the operation of the protective relays. The central panels for this switchgear are contained in the extended control room where also is a diagrammatic circuit panel with coloured indicator lamps, which gives a clear picture of the operational details of the 33 kV circuits. Batteries have also been installed in a room built off the main substation.

The building and civil engineering works were carried out by A. W. Oakley, Ltd., and H. C. Lacey and Sons (Builders), Ltd. The 33 kV air-blast switchgear, 33 kV isolators and 33/22 kV transformers were supplied by the English Electric Co., Ltd.; 22 kV oil circuit breakers and control equipment by A. Reyrolle & Co., Ltd.; neutral earthing equipment by Ferguson, Pailin, Ltd.; 110 V battery by Chloride Batteries, Ltd.; copperwork and 22 kV isolators by British Switchgear Corporation, Ltd.,

Rear view of the substation showing the two 15 MVA 33/22 kV transformers.

and Switchgear & Equipment, Ltd.; the 33 kV and 22 kV interconnecting and multi-core cables being supplied and laid by Pirelli-General Cable Works, Ltd. The construction of overhead lines and the laying and jointing of 22 kV feeders from substation to terminal poles was carried out by the staff of the Luton District.

At the same time new administrative buildings and a canteen have been built at Chaul End, Luton, which were being officially opened last Tuesday by Councillor C. A. Sinfield, J.P., the Mayor.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

WILL you please convey my thanks and appreciation to the British electrical industry for its ready and generous co-operation in arranging for me to see so much of this vast industry.

It has indeed been a pleasure to get around this tightly packed little Isle and see the enormous activity of the British electrical industry. It was also gratifying to meet many executives who have interests in and knowledge of my country, but I hope that many more will also develop in the course of time a similar interest in one of the important units of the British Family, which does a big trade with Britain and can do more.

This good-bye, or better still *au revoir*, to the many nice people I've met and the many friends I have made, will I am sure be taken in lieu of being able to see them all again personally. We in Australia will be pleased to welcome any of you at any time and hope many of you will make the trip either for business or pleasure as soon as possible.

It has certainly been nice knowing you all.

OSWALD MINGAY.

(*Radio-Electrical Weekly, Cheam, Surrey.* Sydney, N.S.W.)

Mistaken Identity

HAVING been connected with the electronic industry all my working life, I have long been a reader of your excellent journal. I should like to point out that in his article "Industry and the House," page 625 of the issue dated 31st March, Mr. Erroll has confused me with my second cousin, Mr. Ian L. Orr-Ewing, who is the Member for Weston-super-Mare. We both have the same Christian name and confusion is easy. As he sat in the House of Commons first, however, I feel that he has priority and I have therefore decided to call myself Charles I. Orr-Ewing. I represent North Hendon.

CHARLES I. ORR-EWING.

House of Commons, S.W.1.

Street Lighting Schemes

TO save the amount cut by the City Council from the estimates for the coming year, LIVERPOOL Lighting Committee has decided to reduce new work by £14,000 and maintenance by £1,000. Conversion to electricity of certain gas-lit bus routes is to be deferred as also have a number of other improvements, including the Dock Road lighting. The Committee is to go forward with wall-bracket lighting, a new development in which the lamps are mounted flush against the walls in side streets where the houses have no gardens or bay windows. These lamps are much more difficult to damage.

After five years' controversy over the respective merits of electricity and gas for street lighting NEWPORT (I.O.W.) Town Council recently approved without discussion a recommendation that the system should be electric. From tenders submitted by the Southern Gas Board and the Southern Electricity Board gas lighting was shown to cost £7 9s 6d a year, the column to remain the property of the Board, and electric lighting £5 9s 8d for a minimum period of ten years, the column then becoming the property of the Corporation. The electric lamps also gave a higher light output.

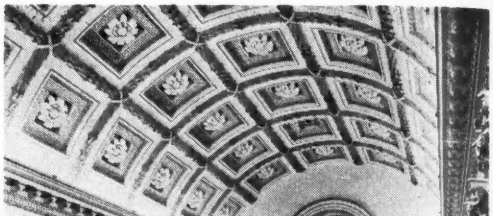
BANSTEAD (Surrey) Council has approved in principle the provision of street lamps throughout the urban district under a seven-year programme.

ST. ASAPH (Flints) Parish Council is applying to the Welsh Board of Health for sanction to borrow £3,000 for electric street lighting.

MANSION HOUSE RESTORATION

New Fluorescent Lighting Installation in Egyptian Hall

THE Egyptian Hall at the Mansion House, London, which had been closed since last August for restoration and reconditioning after wartime damage, was reopened last week, when it was used for the Lord Mayor's Easter banquet. The two 30ft by 13ft stained-glass windows have been repaired and replaced, the interior of the hall redecorated in pale cream and gold, and a new lighting installation provided. The re-lighting of the hall was carried out, with other rehabilitation work, under the supervision of the city surveyor. It was finally decided that the best method for the lighting of the main hall was to use the cornice around the curved ceiling and walls. After experiments fluorescent lighting was adopted to provide an even and comparatively high level of illumination and to create sufficient brightness over the curved and beautifully decorated ceiling.



New fluorescent lighting in the reconditioned Egyptian Hall

To obtain these results special cornice fittings were designed and manufactured by Courtney, Pope (Electrical), Ltd. These were installed along both sides of the existing cornice in continuous rows. Thirty-two units were required, and altogether 128 lamps were used in this part of the installation. "Warm white" lamps were selected as they were found to give the most pleasing effect to the interior decorations. These were supplied by Thorn Electrical Industries, Ltd. The cornice being at a height of 42ft, complete reliability is essential, and instant start apparatus has been incorporated.

Below the gallery 152 lamps are used in the existing coves, which are built into the sides of the decorative beams, forming a distinctive pattern in this particular section. As with the cornices, Courtney, Pope (Electrical) were called upon to design and manufacture the fittings in these coves.

The hall is 82ft long by 50ft wide, and an average illumination of six lumens per sq ft is obtained at floor level. Nevertheless, there is a considerable saving in electricity consumption compared with the previous tungsten installation. The cost of the renovation has been met from the private funds of the City of London, the entire installation being carried out by Girdlestone & Co., Ltd., under the main contractors, Holliday & Greenwood, Ltd.

Management Summer School

The fourth annual "Management" Summer School, organized by the Institute of Industrial Administration will be held from 15th to 22nd July at Oriel College, Oxford. Full particulars can be obtained on application to Mrs. E. A. Carpenter, Institute of Industrial Administration, Management House, 8, Hill Street, W.1.

ELECTRICITY SUPPLY

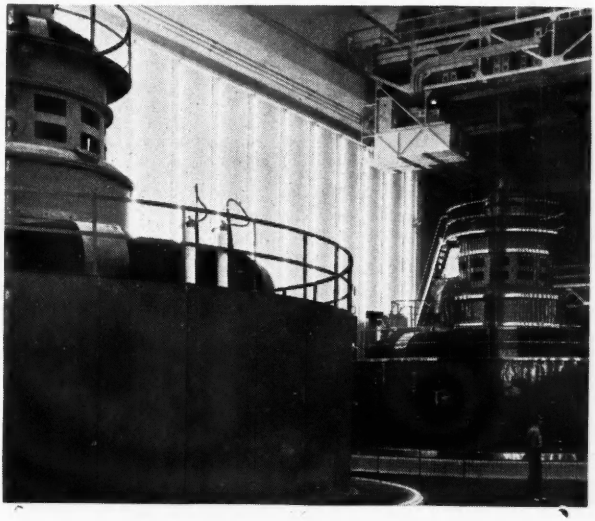
Installations in Pre-war Houses

Progress of Cyprus Electrification

AT a meeting of Cuckfield (Sussex) R.D.C. the vice-chairman stated that the Ministry of Health was putting obstacles in the Council's way with regard to electricity for pre-war houses. The overall cost of the scheme would be about £10,000, but the Council had been asked to review the proposals with a view to deferring the work or limiting it to what was really essential at present. It was decided to await the results of a meeting with the principal regional officer of the Ministry before doing anything further.

Cyprus Power Scheme

It is reported that work has begun on the site of a proposed power station at Dekhelia, near Larnaca, Cyprus, and delivery of plant will soon be made. Besides the 70,000 kW station it is proposed to construct an island-wide distribution network. Details of the scheme, which has been prepared by Preece, Cardew & Rider, consulting engineers (in collaboration with Sir Cyril Kirkpatrick & Partners for the civil engineering work), were published in our issue of 8th July, 1949. The estimated cost of stage I is £2,500,000, including £500,000 for administrative buildings, etc., and the total cost of the scheme is expected to be about £4,000,000. Contracts to the value of £2,000,000 have so far been placed, including building and civil engineering works (Sir Lindsay Parkinson & Co., in association with the Titan Construction & Engineering Co. of Nicosia); turbo-alternators, 66 and 11 kV switchgear and 66 kV transformers (Metropolitan-Vickers); boilers and pipework (John Thompson Water Tube Boilers); house set (Harland & Wolff); 11 kV transformers (Lindley Thompson Transformer & Service Co.); and 66 and 11 kV transmission lines (B.I. Callender's).



Interior lighting installed at the Genissiat power station

B.E.A. Collier Launched

Mrs. J. D. Peattie, wife of the deputy chief engineer (generation) of the British Electricity Authority, last week performed the naming ceremony at the launching from the Wear Dockyard of the single-screw 1,700-ton steamer *Bodmin Moor*. The vessel is the third of four sister ships; the *Mendip* and the *Polden* are already in service.

Power Station Lighting

Special attention has been paid to the illumination of the Genissiat (France) power plant. The machine room is illuminated by "Mazdafluor" tubes arranged in vertical columns on the walls and when the

installation is completed it will comprise about 1,100 fluorescent lamps. In addition to the fluorescent lighting, eighty-one 1,000 W incandescent lamps in special reflectors are to be set into the ceiling in groups of three.

North Wales Misconceptions

Addressing the North Wales District of the Welsh Board for Industry last week, Mr. A. R. Cooper, controller of the B.E.A. Merseyside and North Wales Division, said that the total amount of land which would be flooded under the hydro-electric proposals was a little over three square miles in the five northern schemes and one square mile in the Rheidol scheme. No existing rivers would be dried up or completely diverted and there would be compensation flows in each river affected.

In an interview with a *Manchester Guardian* correspondent he said that work was not likely to start on "anything like a large scale" before 1955.

The Merseyside and North Wales Division has issued a pamphlet in which are reprinted the articles on the proposals by Mr. Cooper and Mr. J. Warnock published in the 27th January and 17th February issues of the *Electrical Review*.

Estate Supply Terms

Middlesbrough Town Council which recently asked the Association of Municipal Corporations to try to reach a national agreement with the British Electricity Authority for the supply of electricity to new housing estates has been informed by the Association that no progress could be made. The B.E.A. stated that the Area Board were autonomous and separate negotiations would have to be carried through with them. Middlesbrough Corporation has already accepted "under protest" the North Eastern Board's terms and several other local authorities are opposing the new arrangements. The terms to which objection is raised relate to rents for substation sites, the laying of cable ducts in roadways and the provision of easy access to the Electricity Board's services in each house. The Councils are being asked to pay for work which they state is the responsibility of the Board.

Power Convention Programme

ARRANGEMENTS for the British Electrical Power Convention at Harrogate from 19th to 23rd June are set out in the official programme which has just been issued. They are similar to those of last year's Convention and the main items are as follows:—

Monday, 19th June.—Issue of delegates' badges, exhibition catalogues, etc., at the Royal Hall throughout the day. Opening of the exhibition at the Sun Pavilion by the President, Sir Vincent de Ferranti, M.C., M.I.E.E., in the afternoon and reception by the Mayor and Mayoress of Harrogate in the evening.

Tuesday, 20th June.—Opening of Convention, civic welcome by the Mayor and presidential address in the morning. Luncheon to Rotarian delegates by the Harrogate Rotary Club. Paper by Sir Henry Self, K.C.B., K.C.M.G., K.B.E. (deputy chairman, B.E.A.) on "The Economics of Electricity Supply" in the afternoon. Ladies to meet Lady Ferranti at tea (Hotel Majestic) when a mannequin parade will be presented. Reception by the President and Lady de Ferranti in the evening.

Wednesday, 21st June.—Paper presented on behalf of the Electric Lamp Manufacturers' Association by Mr. L. J. Davies, M.A., B.Sc., A.M.I.E.E., on "Advances in Lamps and Lighting," followed by discussion. Coach tours in the afternoon have been arranged to Bolton Abbey, Fountains Abbey and York.

Thursday, 22nd June.—Presentation and discussion of the following papers (to be continued in the afternoon): "Operation of Power Stations," prepared by the B.E.A. and read by Mr. J. D. Peattie, B.Sc., A.C.G.I., M.I.E.E., deputy chief engineer (generation), B.E.A.; "Boiler Plant—Present and Future," prepared by the Water-Tube Boilermakers' Association and presented by Mr. W. F. Simonson, B.Sc. (Eng.), A.C.G.I., M.I.Mech.E.; and "Large Modern Steam Turbo-Generating Plant," prepared by the B.E.A.M.A. and presented by Mr. J. T. Moore, B.Sc., M.I.E.E., A.M.Inst.C.E. E.A.W. luncheon at the Lounge Hall, Parliament Street. In the evening the annual dinner (limited to 400) will be a dance at the Royal Hall.

Friday, 23rd June.—General meeting of delegates and conclusion of Convention. In the afternoon a visit has been arranged to the headquarters of the Yorkshire Electricity Board at Scarcroft, Leeds.

During the Convention there will be a competition for the G. P. Dennis Golf Trophy and a four-ball bogey competition in aid of the Electrical Industries Benevolent Association.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

W. T. Henley's Telegraph Works Co., Ltd., reports a group profit of the holding company (subject to audit) for the year ended 31st December last, after meeting all charges and providing £814,402 for taxation, of £758,583, as compared with £841,709 for 1948. In arriving at the profit £105,000 has been charged as provision for contract maintenance, £51,698 has been credited in respect of receipts of earlier years and £14,513 profit on realization of investments. General reserve receives £255,000, replacement of buildings, plant and machinery reserve, £200,000, and fluctuations in prices of materials reserve, £25,000. It is proposed to pay a final ordinary dividend of 10 per cent, plus a cash bonus of 5 per cent, maintaining the distribution for the year at 20 per cent, less tax. The balance carried forward is £961,196 (against £866,313 brought in).

Hall Telephone Accessories, Ltd., reports a trading profit for 1949 of £82,813, as compared with £79,077 for the preceding year, and a net profit of £56,209 (against £55,465), to which is added £12,740 E.P.T. recovered, £2,171 over provisions in previous years and £25,893 brought in, making £97,013. Taxation absorbs £28,846, and £27,500 is placed to investment reserve. The dividend for the year is maintained at 10 per cent, and £22,926 is carried forward.

W. Canning & Co., Ltd., report a net profit for 1949, after providing for taxation, of £173,742, as compared with £186,690 for 1948. General reserve receives £97,288, contingencies £10,932, and reserve to meet increased cost of replacement of fixed assets £25,000. The dividend on the ordinary stock for the year is maintained at 27½ per cent, by a final dividend of 3d per 5s unit, and a bonus of 10½d per 5s unit.

The Ever Ready Co. (Great Britain), Ltd., reports a net profit for the year ended 28th February last, after charging depreciation, of £530,809, as compared with £537,919 for the preceding year. United Kingdom taxation requires £220,000. It is proposed to write down specially, plant, machinery, and establishments by £260,000 out of general reserve. A final ordinary dividend of 20 per cent (against 25 per cent), is recommended, making a total of 35 per cent, less tax, for the year (against 40 per cent). It is stated that the reduced dividend is due to the present high rate of profits tax.

The Ever Ready Trust, Ltd., reports a balance of revenue to 31st March, before taxation, of £35,365, as compared with £33, 454 for the preceding year. Taxation requires £16,591, leaving a net revenue balance of £12,723 (against £16,077). The final ordinary and deferred dividends are 6 per cent (against 8 per cent), making 11 per cent for the year (unchanged).

Laurence, Scott & Electromotors, Ltd., reports a net profit for 1949 of £134,403, as compared with £104,645 for 1948. The dividend on the "A" and "B" ordinary is maintained at 12½ per cent.

The British Electric Resistance Co., Ltd., is again paying an interim dividend of 5 per cent.

Radio Rentals, Ltd., is again paying an interim dividend of 10 per cent.

The Calcutta Tramways, Ltd., has declared an interim dividend of 2½ per cent (unchanged).

NEW COMPANIES

L. H. Alliston & Co., Ltd.—Registered 1st April. Capital £20,000. Manufacturers' agents, representatives and suppliers of scientific instruments and apparatus, in particular electrical apparatus for sound amplification and inter-office communication; electro-medical apparatus, hearing aids and appliances, medical and surgical instruments, etc. Directors: L. H. Alliston and C. W. Hunter. Regd. office: 108, Victoria Street, S.W.1.

Luxelectric, Ltd.—Registered 1st April. Capital £1,000. To acquire the business of an electrical apparatus manufacturer and distributor carried on by George W. Luck, as Luxelectric Developments at 153, Tankerville Drive, Leigh-on-Sea, Essex. Directors: G. W. Luck and Marjorie A. Luck. Regd. office: 153, Tankerville Drive, Leigh-on-Sea.

Red Deer Radio, Ltd.—Registered 6th April. Capital £1,000. To acquire the business of electrical, radio and television dealers carried on at 323, Brighton Road, South Croydon, as Brown & Cook. Directors: R. C. Brown, "Chilworth," Rymer

Road, Croydon, and E. H. Cook, 9, Brampton Road, Croydon.

Phono-Vision, Ltd. — Registered 11th April. Capital £100. Manufacturers of and dealers in electronic devices of all kinds; wireless and television sets, electrical, radio and telephonic apparatus, etc. Subscribers: J. Grahame and C. A. Furne. Regd. office: 10, Coleman Street, E.C.2.

Wellgate Electrical Co., Ltd.—Registered 18th April. Capital £2,000. Manufacturers, repairers and assemblers of and dealers in motor car and other batteries; electrical engineers and contractors, etc. Directors: H. H. Rodwell, R. J. Gale and G. A. E. Goulstone. Regd. office: 33, Gt. James Street, Bedford Row, W.C.1.

W. E. Conyers, Ltd.—Registered 17th April. Capital £5,000. Manufacturers of electric motors, electrical engineers and contractors, wireless, mechanical and general engineers, etc. Directors: W. E. Conyers and Annie Conyers. Regd. office: Greystone Works, Trawden, Nr. Colne.

Electrical Traders, Ltd.—Registered in Dublin 18th March. Capital £5,000. Manufacturers, importers and exporters of, agents for and dealers in electrical machinery, components, wire and wiring equipment, radio and television apparatus, etc. Subscribers: G. F. O'Reilly and Nita May, both of 6, Foster Place, College Green, Dublin.

RECEIVER RELEASED

Nelson Engineering Co., Ltd.—Mr. R. R. Langley, 15, Carr Road, Nelson, ceased to act as receiver on 20th April.

LIQUIDATIONS

Carol Manufacturing Co., Ltd., 45-57, Wanstead Park Road, Ilford, Essex. Electrical and radio manufacturers.—A meeting of creditors was held recently when a statement of affairs was submitted which showed liabilities amounting to £6,373, and assets estimated to produce £687, leaving a deficiency of £5,685. A resolution was passed confirming the voluntary liquidation of the company with Mr. A. E. Attwood, accountant, of 20/21, Lawrence Lane, London, E.C.2, as liquidator, together with a committee of inspection.

Spencer Coates & Co., Ltd., Bush Lane House, Cannon Street, London, E.C.1.—The first meeting of creditors was held on 18th April at the offices of the Board of Trade, Columbia House, Aldwych, London, W.C, when Mr. J. Melville Clark, Official Receiver, reported that the winding-up order was made on 20th March. A resolution was passed for the appointment of Mr. N. W. Osborne, C.A., of 11/12, Finsbury Square, London, E.C.2, as liquidator, together with a committee of inspection.

J. D. McCarthy, Ltd.—Winding up voluntarily. Liquidator, Mr. R. C. Methold, Liverpool Chambers, Worthing.

Southern Wholesale Electrical (Hove), Ltd.—Meetings of contributories and creditors on 26th May at 6 and 7, Old Steine, Brighton, to receive an account of the winding up by the liquidator, Mr. A. E. Orbell.

Duralite, Ltd.—Winding up voluntarily. Liquidator, Sir Harold Barton of Barton, Mayhew & Co., Alderman's House, Bishopsgate, London, E.C.2.

BANKRUPTCIES

T. G. Evett, 3, Lindsey Road, Cleethorpes, electrical contractor, trading as Evetts.—Receiving order made 18th April on debtor's own petition.

H. J. A. Wade and **C. L. Wade,** residing and carrying on business as C. & H. Wade & Co., at 40, Dulwich Road, Herne Hill, London, S.E.24, and lately carrying on business at 68, Brixton Water Lane, Brixton, S.W.2, electrical engineers and contractors.—First meeting 3rd May and public examination 23rd May, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. L. Rose, 9, Wades Hill, Winchmore Hill, London, N.21, electrical engineer.—Receiving order made 6th April on debtor's own petition. First meeting 15th May at 3, Central Buildings, Matthew Parker Street, Westminster, London, S.W.1. Public examination 20th June at the Court House, Edmonton.

R. S. Warrell, trading as R. S. Warrell & Son, residing and carrying on business as an electrician at 2, Norfolk Road, Littlehampton.—Last day for receiving proofs for dividend 9th May. Trustee, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, 1.

L. C. Overton, King Street, Bakewell, electrician.—Last day for receiving proofs for dividend 6th May. Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver.

W. E. Holloway, trading as Dominion Electric Heating Co., 23, Market Street, Birkenhead, electrical contractor.—First dividend of 3s in the £, payable 24th April at the office of Mr. R. C. Johnston, 24, Fenwick Street, Liverpool, 2.

A. F. Howsley, residing at "Summerford," Emesgate Lane, Silverdale, Lancs, and formerly carrying on business as an electrical engineer at 25, Emesgate Lane, Silverdale.—Final dividend of 3s 2d in the £, payable 5th May at 47, Mosley Street, Manchester, 2.

FINANCIAL SECTION

STOCKS and SHARES

HAVING introduced few new elements of any consequence into the investment situation, the Budget has left nothing more than one or two local disturbances in Stock Exchange markets. If it was barren of positive encouragement for industry and business, it at least put no fresh burden, other than the petrol price, upon their backs. Some qualms had been felt previously about the possibility of legislation to enforce the limitation of company dividends. In the event, the Chancellor contented himself with the assertion that continuance of the voluntary agreement is of the first importance to the country. There was little in the speech of direct consequence to the electrical markets, apart from a reference to the still serious bottleneck in power generation.

Dividend Outlook

In his Budget references to dividend limitation, the Chancellor could have found little cause for complaint about the measure of restraint shown either last year or in the dividends declared to date in respect of 1949. Dividends are commonly regarded as being in double harness with wage rates, so far as the Government policy on personal incomes is concerned. In fairness, the Chancellor gave a reminder that wages and salaries have gone up by over a thousand millions in the last two years: this is scarcely a standstill, he observed. Of company profits, he said that some three-quarters go in taxation and new capital expenditure, leaving only a quarter for personal consumption. In the circumstances, the very occasional occurrence of an increased company dividend—for example, the first, and very modest, increase for over thirty years in Reyrolle's distribution—serves only to emphasize industry's moderation at the expense of shareholders.

Cable and Wireless

Cable & Wireless (Holding)'s various offers to stockholders closed to-day, Friday, 28th April, leaving interest to look forward to the Court sanction for the scheme, and, thereafter, to the beginning of dealings in the new stocks created by the reconstruction. Ordinary stockholders feel confident that the new 3 per cent 3½-year loan stock will be worth in the market the price of 100 at which it was offered. The 4 per cent 10-year loan stock offered to preference stockholders is still expected to be well favoured, and likely to develop a useful premium on the issue price of 96. On account of its popularity, however, it is probable that stockholders will see their applications scaled well down.

Owing to the complexities of the scheme, no dealings in Cable & Wireless will take place to-day, Friday, but the market should open on Tuesday next, 2nd May. Everything hangs, actually, upon the applications received for the new ordinary stock. Unless these exceed £4,955,834, the whole plan collapses. Provided the necessary applications are handed in, then it will be for the company to allot the various other stocks over which proprietors of the existing securities held options.

Outstanding Features

In most markets, the changes since a week ago are slight, an outstanding feature being rises of 5 points each in Anglo-American Telegraph deferred stock to 17¼, and the ordinary stock to 55. The preferred put on a point to 97½. No little curiosity has been aroused by the recovery in the stocks. In the effort to find some cause for the buying which produced the improvement, conjecture toyed with the idea that the board might take into consideration a scheme of capital reorganization. No doubt the example of Cable & Wireless gave rise to this theory. Another feature has been the erratic behaviour of Electric & Musical Industries shares. A fortnight ago the price was under 20s; a week back it rose, according to report, to 29s at about 7 o'clock one evening, long after the House was closed. In the Stock Exchange the price touched 28s 6d before receding to 25s 3d, which left a gain on the week of 3s.

The Week's Price Movements

British Electric Traction deferred stock has gone back 20 points to 420 on the increase in the price of petrol. Other price movements since a week ago are mostly upward. Gains of ⅛ have made Associated Electrical Industries 72s 6d and Ericsson 45s. Calcutta Trams are 2s 6d higher at 25s. De La Rue 20s, British Vacuum 10s, Hall Telephone Accessories 14s 6d, Marconi Marine 25s 3d, Chloride Batteries 47s.

Scophony 3s, are 6d to 1s harder. Henleys are unchanged at 22s 6d. Net profit for last year shows a decline, but the regular 20 per cent distribution is very amply covered by the year's earnings. Vactric went back to 7s 6d on abandonment of negotiations for the acquisition of the company by a group of Swedish industrialists. Hackbridge Cable 12s, Ever Ready 32s and Allen West 7s 6d, are better on the week.

HOTEL LIFT SERVICE

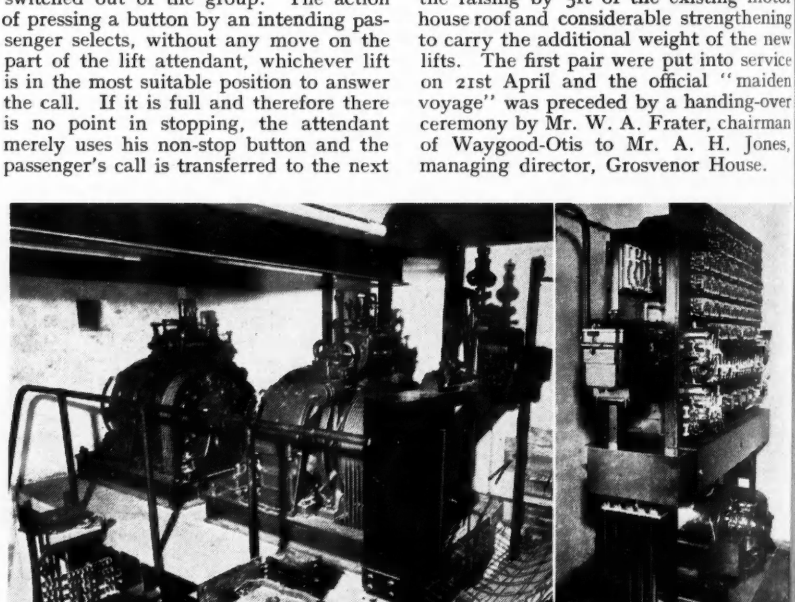
New Installation at Grosvenor House, London

THE four new lifts which are now being installed at Grosvenor House, London, by Waygood-Otis, Ltd., will, it is claimed, provide a speedier service than any other hotel lifts in the world. Even during peak hours no passenger, after calling a lift on any of the 11 floors, will have to wait longer than 28 seconds. Two lifts are already in commission. When all four are in operation, each holding 14 persons, they will have a combined carrying capacity of 114 passengers in five minutes or over 1,300 in an hour. The speed, which is governed by the height of the building, is 400 ft/min.

The lifts work as a unit, although when priority service is required one can be switched out of the group. The action of pressing a button by an intending passenger selects, without any move on the part of the lift attendant, whichever lift is in the most suitable position to answer the call. If it is full and therefore there is no point in stopping, the attendant merely uses his non-stop button and the passenger's call is transferred to the next following lift without the passenger needing to press the landing button a second time. The cars also stop and start in correct "geographical" order irrespective of the order in which the buttons are pressed. Acceleration, deceleration and levelling with the floors are all an automatic process.

Passengers will have the smoothest possible ride as the car platforms float on rubber and the 24 h.p. 125 V d.c. shunt operating machines, which are controlled through an independent generator set for each lift, are gearless. They are also silent-running—an important factor in an hotel.

The installation work has necessitated the raising by 5ft of the existing motor house roof and considerable strengthening to carry the additional weight of the new lifts. The first pair were put into service on 21st April and the official "maiden voyage" was preceded by a handing-over ceremony by Mr. W. A. Frater, chairman of Waygood-Otis to Mr. A. H. Jones, managing director, Grosvenor House.



Left: These 24 h.p. 125 V d.c. main driving motors are gearless and silent running. Right: Each lift is controlled by an m.g. set and associated contactor gear feeding the main driving motor

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Almondsbury (Bristol).—4th May. Parish Council. (a) Supply and erection of 76 street lamps at Patchway; (b) maintenance of lamps after installation. J. R. Freeman, engineer, 59, Lower Union Street, Bristol, 1.

Australia.—NEW SOUTH WALES.—22nd May. Department of Public Works. Ten 2,500 kVA and seven 5,000 kVA transformers. (See 21st April issue.)

QUEENSLAND.—7th June. State Electricity Commission. Gas-cum-oil engine driven generating plant for the Charleville power house. (C.R.E. (I.B.) 49673/50. Ten/1181.)*

9th June. Brisbane. City Council. 33 kV underground and submarine cable, multi-core underground and submarine pilot cable. (C.R.E. (I.B.) 47945/50. Ten/1123.)*

Belfast.—12th May. Electricity Department. Transformers and fire fighting equipment. (See 21st April issue.)

Blackpool.—1st May. Corporation. Supply of 750yd of l.v. cable. (See this issue.)

Breconshire.—County Council. Rewiring and new electrical installation at Tymawr Home Office School, Gilwern, near Abergaveny. (See this issue.)

Cheadle & Gatley.—11th May. U.D.C. Street lighting stores. (See this issue.)

Lincolnshire.—13th May. County Council. Electrical work at Stubton Hall, near Newark. (See 21st April issue.)

North Riding.—11th May. Education Committee. Electrical installation at new county primary school at Saltburn-by-the-Sea. F. Baraclough, secretary, Education Offices, County Hall, Northallerton.

Penzance.—29th May. Borough Council. Installation of electric motors, gearing, etc., for operation of opening gear to floating dock gates. D. J. Beattie, town clerk, Municipal Buildings.

Romsey & Stockbridge.—4th May. Rural District Council. Electrical installations in 80 dwellings on five sites. W. A. Tanner, clerk, Rural Council Offices, Duttons Road, Romsey.

Sheffield.—5th May. City Council. Installation of electrical services in 342 houses on Ballifield Hall estate. W. G. Davies, city architect, Town Hall.

South Africa.—DURBAN.—23rd June. City Council. E.h.v. switchgear for three substations. (C.R.E. (I.B.) 48932/50. Ten/1161.)*

Tangiers.—25th May. Telefonica de Tangier S.A. Telephone receivers. (C.R.E. (I.B.) 49369/50. Ten/1172.)*

Uruguay.—MONTEVIDEO.—22nd May. Usinas Electricas y Telefonos del Estado. Conductor wire. (C.R.E. (I.B.) 50238/50. Ten/1198.)* 30th May. Telephone cable and junction boxes. (C.R.E. (I.B.) 50239/50. Ten/1199.)*

Walton & Weybridge.—12th May. Urban District Council. Electrically driven sewage pumping plant, Apps Court pumping station. Surveyor, Council Offices, Walton-on-Thames.

ORDERS PLACED

Bradford.—Corporation. Rewiring 364 houses (£4,799).—Roberts & Jowett, Ltd. Installation of electricity at Hanson Grammar School, kitchen and dining rooms (£348).—Southern & Redfern, Ltd.

Burnley.—Corporation. Electrical installation work at extensions to Towneley Technical High School (£4,443).—S. Greenhalgh.

London.—WESTMINSTER.—City Council. Installation of electric lighting in 144 flats at Norfolk, Probyn and Jessel Houses which comprise the Regency Street Dwellings (£2,579).—Belshaw & Co., Ltd.

L.C.C. Renewal of electrical installation at South Hackney Secondary School.—W. H. Gaze & Sons, Ltd.

POPLAR.—Borough Council. Electrical installations in 24 three-storey flats at Blair Street (£773).—Iverson Electrical Co., Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses (180), Drill Hall Lane, Church; borough surveyor.

Acton.—Rebuilding factory, Park Royal Road; Medical Supply Association, Ltd., 167-173, Gray's Inn Road, W.C.1.

Alnwick.—Houses (24), Howling Lane West, for U.D.C.; J. Sample, builder, Warkworth.

Ashton-under-Lyne.—Houses (96), Crowhill; borough surveyor.

Ayr.—Houses (100), Forehill; Scottish Special Housing Association, Ltd., 15, Palmerston Place, Edinburgh.

Bangor.—Houses (36), Coed Mawr; Henry Jones & Son, Rhosneigr.

Barrow-in-Furness.—Clothing factory, Ormsgill; Town Tailors, Ltd., Mabgate, Leeds.

Belper.—Extensions to garage of Trent Motor Traction Co., Ltd.; Thorpe & Partners, architects, St. James Street, Derby.

Birkenhead.—Rebuilding works and offices; Kenyon & Scott, Ltd., 264, Cleveland Street.

Houses (98), Woodchurch estate; Wm. Thornton & Sons, Ltd., 38, Wellington Road, Liverpool.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Birmingham.—Post Office Training School, Shirley; Geo. Wimpey & Co., Ltd., builders, Chester Road, Castle Bromwich.

Blackburn.—Secondary school, Witton Park; W. Pickstone, borough engineer.

Bradford.—Laundry, Rooley Lane; city architect.

Brandon.—Houses at Ushaw Moor (36), Esh Winning (68) and Brandon Colliery (36) for U.D.C.; direct labour.

Burton-on-Trent.—Houses (104), Manners estate; borough surveyor.

Cardiff. — Office block, Cathays Park (£240,000); borough surveyor.

Large office block, Greyfriars Road; National Coal Board, S.W. Division, Cambrian Buildings, Mount Stuart Square.

Depot and offices, Colchester Avenue; Mills Scaffolding Co., Ltd., Trussley Works, Hammersmith, W.6.

Carlisle.—Houses (82), London Road; city surveyor.

Additions to works; Morton Sundour Fabrics, Ltd., Denton Works, Lorne Crescent.

Cheltenham.—Additional building for Bishops Cleeve school; Collins & Godfrey, Ltd., builders, The Cross, Tewkesbury.

Darlington.—Additions in West Auckland Road for the Darlington Chemical & Insulating Co., Ltd.; S. W. Milburn & Partners, architects, 9, Esplanade, Sunderland.

Houses, Haughton site south. Builders (all local): Blackett & Son (26); L. C. Abdale (6); and T. E. Robson (4).

Transport depot for T.C. (£8,800); borough architect.

High school for girls (£238,000); borough architect, Central Buildings.

Epsom.—Development scheme for Epsom District Hospital; S. G. Jeeves, architect, 61, Catherine Place, London, S.W.1.

Eston.—Houses (121), Grangetown estate; U.D.C. surveyor.

Factory, Station Road, South Bank; Mineral Wood Products, Ltd., 10, Lower Grosvenor Place, S.W.1.

Farnham.—Houses (60), Heath End; U.D.C. surveyor.

Garston.—Extensions to Building Research Station; Donald Lockhart, Ltd., builders, 235, High Street, Berkhamsted.

Gateshead.—Technical college; Havery (Contractors), Ltd., 38, The Side, Newcastle-on-Tyne.

Glasgow.—Factory, St. James' Road; William Collins, Sons & Co., Ltd., 144, Cathedral Street.

Works extensions; Clydesdale Cabinet Works, Ltd., 100, Eliot Street.

Halifax.—Factory, offices, canteen, etc., Wakefield Road; Dargue Bros., Ltd., drawing office appliance makers, South Street.

Hull.—Reconstruction of Wilson wing, Hull Royal Infirmary; Gelder & Kitchen, architects, 120, Alfred Gelder Street.

Kidderminster.—Factory extensions; Carpet Trades, Ltd., Castle Mills, New Road.

Kingston-on-Thames.—Office block, 55, High Street; E. A. Stone, Toms & Partners, architects, 20, Berkeley Street, W.1.

London.—CHELSEA.—Twin operating theatres, St. Stephen's Hospital (£28,400), for South West Metropolitan Regional Hospital Board; Fleetwood, Buss & Anns, architects, Gray's Inn Road, W.C.1.

Manchester. — Rebuilding warehouse for Baxendales, Ltd.; A. Roland Walsingham, architect, 32, Deansgate, Manchester.

Norwich.—Four-storey factory, Westwick Street; Coleman & Co., Ltd., Prince of Wales Road.

Oxford.—Teaching block at Wingfield Morris Orthopædic Hospital; Oxford Regional Hospital Board, 43, Banbury Road.

Plymouth.—Out-patients' block at Mount Gold Orthopædic Hospital (£50,000); South Western Regional Hospital Board, 2, Elton Road, Tyndalls Park, Bristol.

Reading.—Block of shops and offices, Friar Street and Station Road; Prudential Assurance Co., Ltd., Holborn Bars, E.C.1.

Works extensions; Eastern Press, Ltd., Katesgrove Lane.

Public service vehicle garage, Basingstoke Road; borough surveyor.

Sunderland.—Rebuilding factory of Winburn, Ltd.; Newrick & Blackbell, John Street, Sunderland.

Extensions to a furniture factory at Grangetown; W. & T. R. Milburn, 17, Fawcett Street.

Extensions to factory on the Pallion trading estate; Stephenson & Gillis, architects, Saville Chambers, North Street, Newcastle-on-Tyne.

Additions to Sunderland Technical College (£114,000); Gordon Durham & Co., Ltd., builders, East Boldon, Co. Durham.

Houses for T.C. Builders: J. W. White, Ltd., High Barnes Works, Sunderland (24); Stewart Brothers, Lambton Terrace, Sunderland (20); F. Stewart, Thorney Close, Sunderland (28); Wigham and Son, Shephard Terrace, Hylton (12); J. Prentice, Leighton Road, Sunderland (18); and J. W. Ridley, Sheepfolds, Sunderland (24).

Tenby.—Houses (22), Glebe estate; borough surveyor.

Tipton.—Works extensions; John Cashmore, Ltd., Eagle Works, Great Bridge.

Houses (92), Roberts Field site; J. Ashmore (Builders), Ltd., Bromford Lane, West Bromwich.

Truro.—Out-patients' and nurses' educational sections and nurses' home at Royal Cornwall Infirmary; A. J. Cornelius, architect, 13, Lemon Street.

Tynemouth.—Technical college (preliminary plans approved); W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Wembley.—Flats (114), King's Drive; borough surveyor.

West Bromwich.—Factory extension, Friar Park Road; Buckland & Haywood, architects, Norwich Union Chambers, Congreve Street, Birmingham.

West Ewell (Surrey).—Primary school, Riverview Road; county architect, County Hall, Kingston-on-Thames.

Whickham-on-Tyne.—Houses (72), Dunston; surveyor, Council Offices, Whickham.

Worthing.—Flats (20), Southview Gardens; D. F. Woodward, 22, Wallace Avenue.

Junior and infants' school, Marlborough Road; schools architect, Town Hall.